AMERICAN MACHINIST

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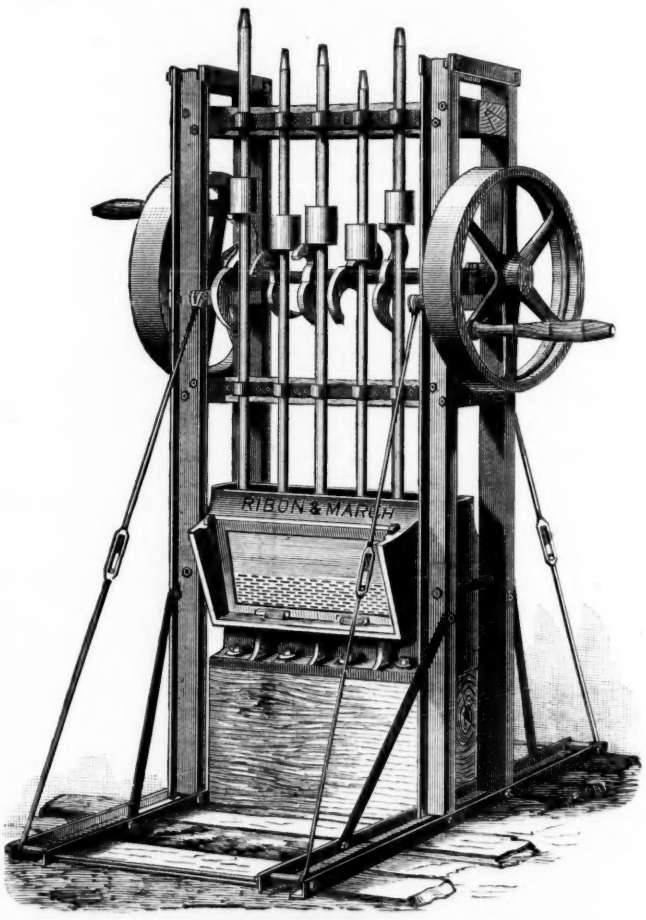
New Stamping Mills.

In prospecting or searching for ore in mining countries it is of very great importance to provide suitable means for rapidly reducing the quartz, and other mineral substances, to arrive at the practical value of the gold or silver contained therein.

In devising machines to accomplish the above purpose, two things are necessary: To make an apparatus as light and portable as possible, and yet possessing a capacity of reducing as great a quantity of ore as possible in a given time. The prospecting stamp mill, represented by the engraving upon this page, was designed particularly for the purpose referred to. It has five stamps and weighs but 2,000 pounds complete and ready for operation, without mortar block and mud sills. It is put together with bolts and nuts, instead of rivets, and can be readily taken apart and transported anywhere on the backs of animals, the heaviest piece weighing about 420 pounds. The mortar is made either for ordinary stamping and crushing, or with flaring back and front ledges to support inside copper plates for amalgamating within the battery.



PROSPECTING STAMP MILL.

The battery is mounted upon a wrought iron frame, and has two band balance wheels 30″ x 3½,″ arranged for hand, horse or other power. All wearing parts, such as cams, tappets, heads, shoes, and dies are made of the best cast steel. Though light and portable, it is said to be capable of crushing from 250 to 300 pounds of ordinary hard quartz rock per hour, at sixty blows of a fall of 6″ per minute, through a No. 6 slot screen.

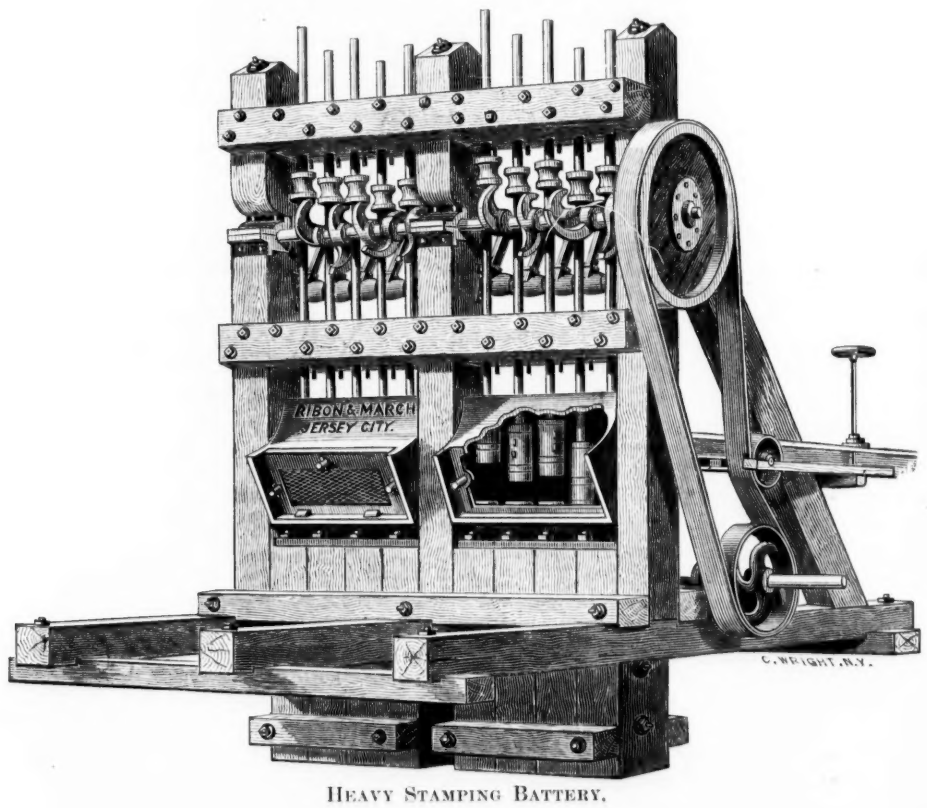
The heavy stamping battery, represented by the other accompanying engraving, is intended for a permanent plant, and is built with ten stamps in one frame, which are driven by one shaft and pulley. These mills are for extra heavy work, or when desirable may be built with two independent shafts, driving five stamps each.

Each of the stamps attached to this mill weighs 650 pounds, the wearing parts all being made of steel, as in the prospecting mill.

This stamp is said to crush and work through a No. 6 slot screen every twenty-four hours, one and a half tons of ordinary quartz rock at sixty blows of 9″ drop per minute for each stamp used.

Both machines described are furnished with Ribon's sectional steel cam, which is shown on our second page. This cam, which is single or double, as desired, is made in two pieces, fastened together by a stirrup and key, both of which—and the joint between the two sections—will be readily understood by an inspection of the engraving. The difficulty of replacing a worn or broken cam of the old pattern, especially when located between journals or other cams, is well known to millmen. The Ribon cam may be removed and replaced without necessitating the removal of the cam shaft from its bearings, or the shifting of any other cam or pulley on the shaft, thus obviating much hard and tedious labor, which is an important item in operating a mill. A broken or worn-out cam of this kind can be removed and replaced in twenty minutes, or less, on any part of the shaft, and being of cast steel, possesses great durability.

The machines and cam described are made by Ribon & March, 144 and 146 First street, Jersey City, N. J.



HEAVY STAMPING BATTERY.

Development of the Iron Business.

History does not record the date when iron was first manufactured from its ores, but we learn that meteoric iron was discovered on Mount Ida, in Crete, 1500 B.C. The art of making wrought iron was well known at the opening of the Christian Era, as the great wrought iron pillar of Delhi, weighing 34,000 pounds, was erected in A.D. 319. The early method of making iron was evidently by smelting, or, as we now term it, by sinking the ores in a charcoal fire known as the Catalan forge, because there is no evidence of a knowledge of cast iron previous to the fifteenth century. In 1543, Ralph Hogg succeeded in making fluid iron, and his product was called pig metal, because it was made by a *hogg*. It is recorded that this pig was fed on charcoal, limestone and iron ore, puffed up with air, which was blown into it by leather bellows run by water power. The product of Hogg's furnace was one ton per week. In 1619 Dud Dudley, eldest son of Lord Dudley, built a blast furnace which produced seven tons of pig metal per week, by the use of bituminous pit coal. But this was too much for that age. Dudley was mobbed, his works destroyed, and he was jailed in the Tower of London. In 1735, Abraham Darby made the first pig metal by the use of coke, at Colebrookdale in England; his furnace made ten tons per week. In 1783 Henry Cort invented the sand-bottom puddling process; and in 1784 he invented grooved rolls for rolling bar iron. These improvements were put into use at his works in Gosport, England. In 1816 Samuel Rodgers improved Cort's puddling process by dispensing with the sand bottom, and using instead an iron bottom with a basic lining of oxide of iron, which is used to the present day. In 1831 Neilson invented the hot blast. In 1836 anthracite coal was first used in making pig metal. In 1839 the first anthracite pig metal was made in the United States; it was made at the Pioneer Furnace, Pottsville, Pa. In 1856 Henry Bessemer invented the Bessemer process. In 1867 the open-hearth process was first patented in the United States.

Sir Henry Bessemer has lived to see the enormous production of four million tons of steel per annum by his process; while poor Dud Dudley was mobbed and jailed, and broken down so that he died in poverty, because he invented a furnace by which he could make seven tons per week. Reader, is it not a fact that, next to religion, iron and steel are the great civilizing elements of the world?

The Western Society of Engineers, Chicago, propose to offer prizes for valuable papers whose publication shall be secured; also to get together a full scientific library and secure commodious rooms which shall be kept open day and evening. At a late meeting it was resolved that the chair appoint a committee for the purpose of making extracts from the current engineering publications of the day, to be read at the Society's meetings and to suggest subjects for debate. The Society meets twice a month, and is in a progressive and flourishing condition.

It is said that a substitute for India rubber and gutta percha has been discovered. It is made by boiling equal parts of hemp, linseed and coal tar oil, and afterwards adding from 5 to 10 per cent. of ozocerite and some spermaceti, and, lastly, from 7 to 12 per cent of sulphur.

Some Suggestions to Apprentices.

We can imagine nine out of every ten apprentices who, upon reading the title of this editorial, will exclaim: "Pooh! nonsense! some newspaper man has struck an idea and proceeds to give the apprentices a lecture, which may appear well enough upon paper and read very nicely, but is worth nothing in practice." But the tenth apprentice will carefully read every word and endeavor to carry out our suggestions. We may say, at the outset, that we were once an apprentice, and have passed through all the trials and tribulations, as well as participating in all the recreations, enjoyment, and satisfaction of duty well performed, to which all apprentices are subjected while passing through a regular apprenticeship in the shop. A boy upon entering a large shop upon an apprenticeship, particularly if he has left home for the first time, feels full of apprehension, when first viewed and addressed by the *nom de plume* of Yank, Curley, Nipper, or some other term which has been applied to him, sometimes appropriately, and at others unjustly, by the other apprentices in the shop.

The future of the apprentice depends largely upon the course he adopts the first month spent in the shop. For instance, he makes the acquaintance of the boys in the shop, of which there are almost always two classes, good and bad. We have a knowledge of a very few shops where there are only a few apprentices who are either all good, or all bad. They are generally mixed. These new acquaintances have a very great influence over the young apprentice, and if he allows himself to be controlled by the moral and intellectual class, his progress in the right direction will be assured; but if he cultivates the acquaintance of the immoral class, begins the use of tobacco, and carries it to excess, spends his evenings in saloons or on the street, he is drawn from the path of virtue and morality, and finally is awakened to the fact that he is a total moral and physical wreck. This is a most important period in the life of an apprentice, and too much stress cannot be laid upon it. The apprentice should be exceedingly careful in selecting his companions, and become intimate with no one that he would hesitate to recognize in the most refined society. He should aim high, and by his careful deportment obtain admission into the presence of influential persons, ever bearing in mind that no sphere is beyond his reach. The young man should next cultivate the acquaintance of the oldest and best workmen in the shop, for, if there is anything that is pleasing to an old journeyman and will cause him to ventilate his ideas, it is to be assisted by an apprentice who is deeply interested in his work, manifesting sufficient interest in the same to hold a tool without causing the man to skin his knuckles, or hold a lamp without singing his hair or whiskers.

By following the course suggested, the boy puts himself in a position to profit by the experience of the oldest hands, which will enable him to rapidly advance. A very essential trait in the character of an apprentice is to be cheerful and even tempered, always having a proper answer for every one when addressed.

In a short time the rougher class will learn to respect him for his good qualities. The moral and intellectual class will also take a deeper interest in his welfare. Instead of spending his evenings on the street or in saloons, the apprentice should attend occasional lectures, or, if possible, a night school. He should, above all things, avoid *clubs*, and other societies, except those that have a tendency to elevate the moral, social and intellectual condition of humanity. The first acquisition of an apprentice should be a box of good instruments, and a reliable book of instruction on mechanical drawing. These should not be placed in the bottom of his trunk, and only brought out once a month for inspection, but should be regularly used. Mechanical drawing is a valuable acquisition for every man, woman and child, even if not in mechanical pursuits.

SECTIONAL STEEL CAM.

If the apprentice, during his shop experience, develops what appears to him valuable ideas or improvements upon the present system of doing work, he should never say to the foreman, "This ought to be done" this way or that, but rather say, very modestly, "Would it not be better to do it this way or that?"

The former expression would generally awaken an idea in the mind of the foreman that the "cub" was getting to know more than the boss, while the latter expression would attract his attention at once, and if the suggestions were really valuable would be adopted, thus allowing the young man to cultivate his inventive genius.

The apprentice frequently has to do disagreeable pieces of work, such as putting up a tackle or hanging a counter shaft in a blacksmith shop, or washing out a boiler, or turning and cutting an extra large number of patch bolts, besides going into a hot, dirty boiler.

The fact is, every apprentice has to pass through a probation of this sort, but he should look beyond these disagreeable experiences to the time when he will occupy the position of a superintendent or master mechanic, and looking back will deeply appreciate the knowledge gained through the infliction of what then seemed to him grievous and often unnecessary punishment. The apprentice should cheerfully take the bitter with the sweet, carefully observing cause and effect as he progresses, resting assured that the time will surely come when he will prize the knowledge thus obtained. Let him avoid grumbling lest it become chronic, for there is no person who suffers from the wrongs of others, and the rash conduct of himself, so much as the *chronic grumbler*.

A record book should be kept, in which to jot down items of interest in connection with shop experience, carefully sketching out parts of machinery and engines, to be used for future reference.

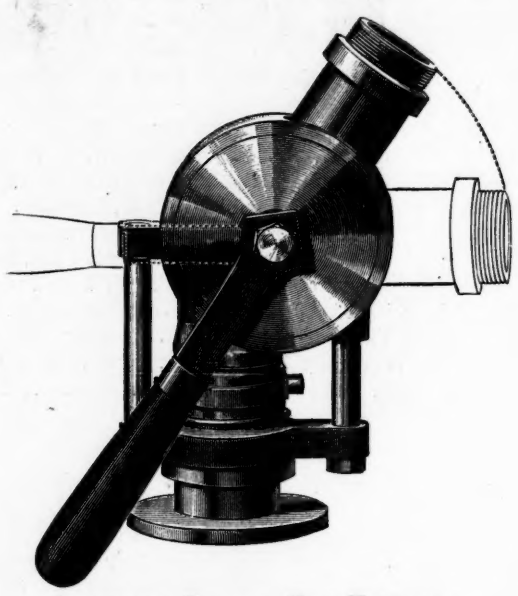
An apprentice should cultivate a taste for reading such matter as will advance him in his business, carefully avoiding the useless and trashy literature with which the country is flooded. Finally, the apprentice should be modest, realizing that he should assume to know very little, rather letting others find out his true caliber. He should be cautious, self-reliant, kind and sympathetic. Let him expect large things in the future. He should always help a shopmate when possible. It will never injure him, and the recollection will afford much satisfaction.

Adjustable Pipe for Fire Hydrants.

All persons are familiar with the difficulty which occurs in holding a hose pipe under heavy pressure, especially in extremely cold weather, or under the exposure to heat from a burning building.

The cut herewith represents an adjustable pipe to be attached to fire hydrants, which is described and endorsed, as follows, in a recent special report of the Boston Manufacturers' Mutual Fire Insurance Company:

The invention of Mr. Morse consists in a pipe to be attached to any hydrant, either in a yard or upon a stand pipe or roof, to which pipe any direction may be given, either vertical or horizontal. The change of direction can be made with very little exertion, even as to a 2″ stream operated under 125 pounds pressure or more, and carrying about 1,000 gallons of water per minute.



ADJUSTABLE PIPE FOR FIRE HYDRANTS.

The cut will make the usefulness of this device perfectly clear. This pipe may be of the greatest service when attached to a yard hydrant, between mills that are exposed to each other, as it can be directed by means of a long rod, from a safe distance, long after it may have ceased to be possible for men to bear the heat near the hydrant.

The end of the pipe may be flattened, so as to throw a wide sheet of water to protect the end of a building, without breaking windows by the force of a solid stream.

If these pipes are attached to stand pipes at the several stories of a mill, they may be worked by a gate in the yard, when it would be impossible for men to stand upon platforms. Outside stand pipes have been of little service heretofore, because of the narrow and exposed standing-room on platforms.

The pipes attached to hydrants on stand pipes should especially be furnished with a flattened nozzle, so that when left to themselves they will throw a sheet of water over a wide space, rather than a solid stream in only one direction.

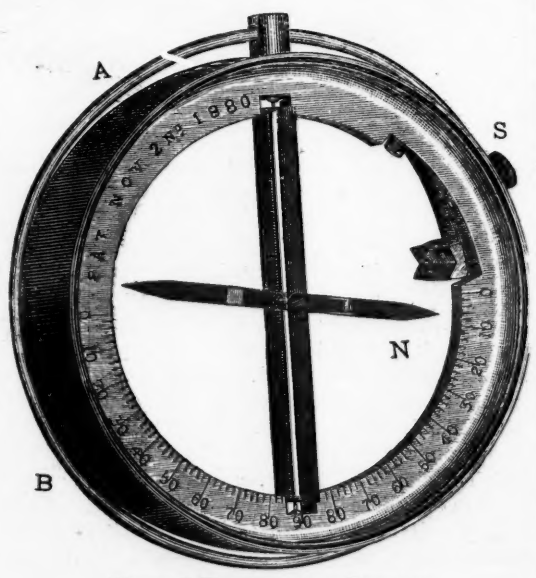
If these pipes were attached to hydrants upon the roofs of buildings, very effective work could be done that it might be impossible for hosemen to perform.

The idea of this pipe being suggested, almost every agent of a factory will be able to see how it can be placed, and various devices will doubtless be found for directing the stream from a distance, or for one man to approach it to alter the direction (if himself is protected, for the duty of a moment, by a fire-shield or mask), even in a place where he could not stay to work it.

This adjustable pipe is made by A. J. Morse & Son, 140 Congress street, Boston, Mass.

Miners' Prospecting Compass.

The accompanying illustration represents a new Meridian Finder or Miner's Compass, adapted for use in locating bodies of magnetic iron ore underground in mining regions.



MINERS' PROSPECTING COMPASS.

To use it, hold it by the suspension ring *A;* the needle must now be released from its fixed position, by simply unscrewing the small screw *S*, shown on the outside of the frame of the compass; the moment the needle is released, it will try to find the true magnetic meridian, and in doing so, it may possibly come in contact with either of the two glasses placed on each side of the frame *B*, to protect the needle, graduations, etc., from the weather; it is only necessary then to turn the body of the compass so that the needle swings free of the glasses. The needle will now point in the direction of the true magnetic meridian; the surveyor then can notice the magnetic dip, caused by the amount or extent of the magnetic iron ore, which will be found of great value because it indicates the strongest point of magnetic attraction in a survey.

The chief advantage claimed for this instrument is in the needle having a motion in azimuth as well as in altitude, thereby ensuring the needle finding its own true magnetic meridian; moreover, the needle is suspended in such a way that nothing impedes it from making a complete revolution, so that the all important and final test of reversion can be applied to prove its accuracy. The old style has a motion in altitude only, and if held in any position out of the true magnetic meridian will cause great friction on the pivots, and indicate a dip of the needle not warranted by the magnetic attraction, and of course misleading the prospector. Another advantage consists in its great sensitiveness to magnetic attraction.

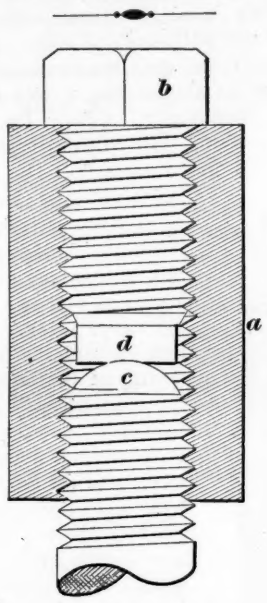
The makers are W. Gardam & Sons, 96 John street, New York.

The Basic Dephosphorizing Process.

From the papers read before the technical societies, by M. A. Pourcel, of Terre Noir, France; Prof. Von Ehrenwerth, of Leoben School of Mines; R. Pink, of Hoerde, Westphalia; Prof. Von Yunner, of Leoben; Jacob Reese, of Pittsburgh, and other eminent metallurgical engineers, we learn that it is probable that the basic dephosphorizing process will soon supersede the old process of puddling, as the new process will produce *wrought iron* by means of the Bessemer converter, as well as steel, and will produce the wrought iron of a better quality and at a cheaper cost than the same class of pig metal can be worked by the puddling process. The puddling process requires two hours to convert five hundred pounds of pig metal into wrought iron, while the basic dephosphorizing process will convert ten tons of pig metal into steel or into wrought ron in twenty minutes.

THE CAR-WHEEL QUESTION.—The *Oil City Derrick* thus answers one of its correspondents: "Alphonzo—You ask how the outer car wheels keep up with the inner ones when the train goes round a curve. The explanation, my dear sir, is very simple. The outer car wheels do not keep up with the inner ones. As you know, the railways of our country are very crooked. They are made up principally of curves. Suppose the first curve outside a city turns to the right; then, as the wheels on the left rail have to travel further than those on the inside, they naturally run faster and get ahead, but the next curve turns to the left, and then those wheels on the right rail hurry around the curve and catch up with those on the left, and as the curves to the right equal those to the left, the result is that on long roads the wheels keep about even. Sometimes, when the train strikes a straight road after making a long curve, the wheels on one side may be half a mile behind, and if you look out of the rear windows you will see them coming down the track. You have heard of trains waiting because they

are ahead of time. Well, this is when the curves are all in one direction, and they are obliged to stop to allow the wheels on one side to catch up with the train."



Shop Kinks.—No. V.

BY L. F. LYNE.

The practice in most shops for screwing short studs into boilers, and other places, is to use two nuts—jamming them together tightly with wrenches; then after applying a wrench to the outside nut, screw the stud into its place. This method of procedure is satisfactory when the fit has been very nicely made, and all other conditions are right. But in most cases the nuts have to be jammed so tightly as to strain the threads, the workman loses his patience and the job is done unsatisfactorily, besides occupying more time than is necessary. I have worked in shops where numbers of studs were spoiled by the process just described, and the studs which were screwed into their places looked as if the job had been done by a *shoemaker*, instead of a machinist. In some shops iron nuts are used by being bored to a certain depth and tapped. The stud is screwed into this nut, then by applying a wrench the stud may be screwed into its place. These nuts are good when new, but they soon get worn and stretched out of shape; then the depth of the hole cannot be changed conveniently, which is frequently a great advantage, particularly for short studs.

In other shops a long nut is used, having a hole bored and tapped in one end to fit the stud, while the other end is provided with a set screw to vary the depth of the hole as required. This is another step in the right direction, but considerable time is required to make it; besides, when the end becomes worn, the nut must be thrown away.

A device that I have made and used with entire satisfaction, for applying studs of all lengths, is shown in the accompanying engraving. It consists of a long steel hexagon nut *a*, which is bored through and tapped with a regular nut tap. A steel set screw *b*, is fitted to the hole, having a loose steel disc *d*, attached to the end by either a pin or screw, and is hollowed to fit the end of the stud *c*. Copper may be used instead of steel but will be invariably pressed into the threads, which seriously interferes with the action of the screw.

Some of the advantages of nuts constructed in this way are that they wear very little, and when one end is worn out the set screw *b*, is removed from one end and placed in the other, thereby furnishing a new as well as a standard fit for use.

Each nut made in this way is equivalent to two new nuts, as double the wear is secured with less labor than is generally employed in making nuts for the same purpose. This style of nut has been used for several years in one shop, and could be generally adopted and used profitably.

No royalty is required for using this device, and no excuse for not adopting it will be accepted.

Combination Faucet for Excluding Sewer Gas from Houses.

The engraving shown herewith represents the "Norton attachment" for excluding sewer gas from houses.

The water pipes leading to, and waste pipes leading from, the various wash bowls, bath tubs, kitchen sinks, water closets, or other openings in a house, are provided with a combination faucet, operated by a single quarter turn of a handle, conveniently located at each wash bowl or other fixture mentioned, which simultaneously opens the waste and water pipes, or closes the same.

This attachment is designed to be applied to the pipes below the ordinary "S" trap, so that when the waste pipes are open to discharge the water, the gas cannot pass through. At other times, all communication between the sewer and the room is cut off by a heavy brass faucet. The same handle which opens and closes the waste pipe also shuts off, or lets on, to the faucets the hot and cold water, preventing the possibility of overflow.

It is easily applied to the fixtures already in use, without the trouble and expense of tearing up the house.

The invention is offered to the public by Norton Bros., 40 to 46 River street, Chicago, Ill.

New Hand Lathe.

On this page appears a cut of a new hand lathe built by the Hendey Machine Company, Wolcottville, Conn. It has a bed five feet long and swings twelve inches. It has also a hollow spindle, and the boxes are fitted to tapering recesses, and are split so that any wear may be taken up by means of a nut on each end of the boxes. A plate for a slide-rest is accurately fitted upon the ways.

A substantial tool shelf, four feet long and eight inches wide, is securely fastened to the back of the bed upon iron brackets. Cam clamps are used to tighten tail block and rest. The cones on both the lathe and countershaft are of iron, have four steps, and are turned both inside and outside to secure a perfect balance.

NEW HAND LATHE.

Newly-Incorporated Companies.

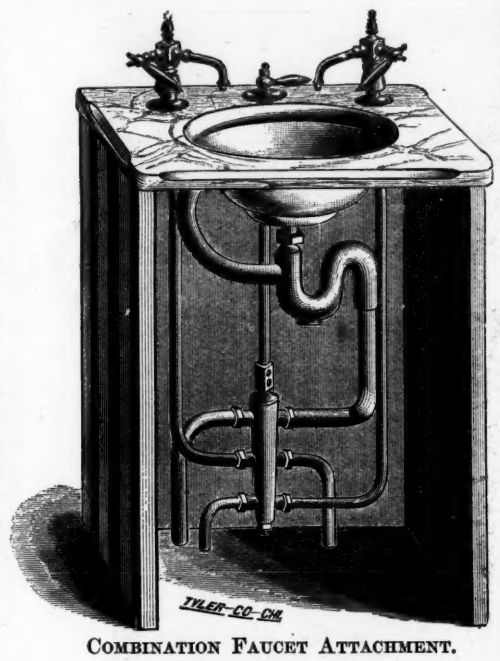
NEW YORK.

American Telegraph and Cable Company. Jay Gould, Fred. L. Ames and others, incorporators. Capital, $20,000,000, in shares of $100 each. To construct, maintain and operate a telegraph line from New York to Portland or Bangor, Maine, through provinces of New Brunswick, Nova Scotia and Cape Breton, thence by submarine cable to England, Ireland, France and Spain, and from points on Pacific coast to Japan, China and Australia. Jan. 19.

The Matchless Sewing and Embroidering Machine Company, New York. Chauncey T. Bowen, J. Bonton Crosby and others, incorporators. Capital, $100,000, in shares of $100 each. For the manufacture and sale of sewing machines, with various appliances and attachments thereto for ordinary sewing—button holes, embroidery, braiding, gimps, cords, etc. Jan. 20.

The Roslyn Silk Manufacturing Company of Roslyn, L. I. Louis Dumas, Benj. C. Kirk, and others, incorporators. Capital $12,500, in shares of $25 each. To purchase, manufacture and sell silks and silk goods in their various forms and component parts. Jan. 20.

The Union Company, New York. R. G. Bradford, Henry H. Storms, and others, incorporators. Capital $30,000, in shares of $10 each. For the manufacture and sale of articles and preparations for mechanical and domestic use. Jan. 24.



COMBINATION FAUCET ATTACHMENT.

The National Manufacturing Company, New York. Weeks W. Culver, Robert I. Powell, and others, incorporators. Capital $200,000, in shares of $100 each. For the manufacture and sale of iron and tin into any form; the rolling of iron, brass, tin and copper in any form, etc. Jan. 21.

Victor Knitting Mills Company, Cohoes. John H. Akin, H. B. Sullivan, and others, incorporators. Capital $30,000, in shares of $100 each. For the manufacture and sale of silk, linen or cotton goods. Jan. 21.

The United States Water Meter Company, New York. C. D. Chase, Wm. H. Marston, and others, incorporators. Capital $1,500,000, in shares of $50 each. For the manufacture and sale of water meters and water machinery, and the renting of the same. Jan. 22.

The Spring Horse Shoe Company, New York. Wm. H. Crossman, Geo. W. Crossman, and others, incorporators. Capital $250,000, in shares of $100 each. For the manufacture and sale of horse shoes. Jan. 24.

The Consolidated Lining Company, New York and Chicago. Henry K. Spaulding, Jno. L. Norton and others, incorporators. Capital, $250,000 in shares of $5 each. For the manufacture and sale of lined paper boards and other lined sheets of fabrics. Jan. 24.

Standard Metallic Paint Company, New York, Andrew P. VanTuyl, G. Gilbert VanTuyl and others, incorporators. Capital, $1,200, in shares of $10 each. For the manufacture and sale of metallic paints, ochres, umbers, ground minerals and other materials. Jan. 18.

The Winter Refining Company, New York, A. W. Winter, R. Delafield and others, incorporators. Capital, $100,000, in shares of $100 each. For the manufacture and sale of refined fats and oils, vegetable, animal and mineral, and apparatus of all kinds for refining fats and oils. Jan. 17.

Charles Pratt & Co., Newtown, Queens County, N. Y., Charles Pratt, Henry H. Rogers and others, incorporators. Capital, $500,000, in shares of $100 each. For the manufacture and sale of petroleum or carbon oils, and the products thereof, and packages for the same, also lubricating and illuminating oils. Jan. 17.

The South Cairo and East Durham Railroad Company. Isaac Pruyn, A. Melvin Osborn, and others, incorporators. Capital $100,000, in shares of $50 each. To construct, maintain and operate a railroad from South Cairo to East Durham, Green County, N. Y., length about ten miles. January 18th.

Potsdam aud Montreal Railroad Company. Samuel Sloan, Talcott H. Camp, and others, incorporators. Capital $500,000, in shares of $100 each. To construct, maintain and operate a railroad from a connection with the R. C. & W. R. R. in the village of Norwood, town of Potsdam, extending northeasterly through the counties of St. Lawrence and Franklin, to boundary line of State of New York, at or near Fort Covington. Length of road about 40 miles. Jan. 18th.

Stony Clove and Catskill Mountain Railroad Company. Thomas Cornell, Wm. F. Romer and others incorporators. Capital $200,000, in shares of $100 each. To construct, maintain and operate a railroad extending from the village of Phonecia, Ulster County, to village of Hunter, Greene County, and from a point on line of said road about two miles from village of Hunter to a point in Green County about one mile from Catskill Mountain House. Jan. 19th.

Hydro-Pneumatic Pump Company, New York. Henry C. Sergeant, George A. Barnard, and others, incorporators; Capital $10,000, in shares of $10 each. For the manufacture and sale of Moore's Hydro-Pneumatic Pump and other machinery for the purpose of compressing air. Jan. 19th.

PENNSYLVANIA.

The Arnot and Pine Creek Railroad Company, Blossburg. L. H. Shattuck, S. B. Elliott and others, incorporators. Capital, $120,000, in shares of $100 each. For the construction of a railroad, twelve miles in length, from Arnot, in Tioga county, to a point at or near Woodland Tannery, on Babb's Creek, in said county.

Warren and State Line Railroad Company; principal office in Philadelphia. W. McCool Taylor, A. Sydney Biddle and others, incorporators. Capital, $250,000, in shares of $100 each. For the construction of a railroad, twenty five miles in length, from Warren, in the county of Warren, to a point on the New York State line, at or near where the Allegheny river crosses said line.

The South Fayette Railroad Company, Pittsburgh. John H. McCreery, R. F. Ramsey and others, incorporators. Capital, $80,000, in shares of $50 each. For the construction of a railroad, eight miles in length, from a point in Chartiers township, Allegheny county, west of the Pittsburgh, Cincinnati and St. Louis Railway, and near the works of the Pennsylvania Lead Company, to a point near the mouth of Miller's Run, on Chartiers Creek.

Bradford Railway Company, Bradford. J. D. Mandeville, Geo. A. Berry and others, incorporators. Capital, $84,000, in shares of $100 each. For the construction of a railroad, fourteen miles in length, from Bradford, in McKean county, to a point on the line between the townships of La Fayette and Hamilton, in said county.

Pennsylvania Aluminum and Nickel Company, Philadelphia. W. B. Spear, Jno. J. Guilliams and others, incorporators. Capital, $26,000, in shares of $50 each. For mining and smelting nickel and other ores; refining metals and drosses; manufacture of chemical products, especially salts and solutions for plating aluminum and other metals; manufacture of metallic aluminum and nickel alloys, and coating one metal with another.

Kinzua Railway Company, Bradford. John J. Mandeville, George A. Berry and others, incorporators. Capital, $84,000, in shares of $100 each. For the construction of a railroad, fourteen miles in length, from a point in the township of La Fayette, in McKean county, near the east line of the township of Hamilton, to Kinzua, Warren county.

CONNECTICUT.

The Bissell Railroad Station Indicator Company, Hartford. Capital $10,000, in shares of $25 each. For manufacturing the Bissell Railroad Indicator. Certificate filed January 21.

High-Speed Engines.—A Reminiscence.

BY A. B. COUCH.

In an article in a recent scientific periodical, the Porter-Allen engine is mentioned as "the pioneer of high-speed engines." The writer is reminded of a tolerably-successful attempt in that direction made thirty years ago, a brief description of which may possess some interest, and certainly cannot detract from the well-earned high position of the Porter-Allen engine.

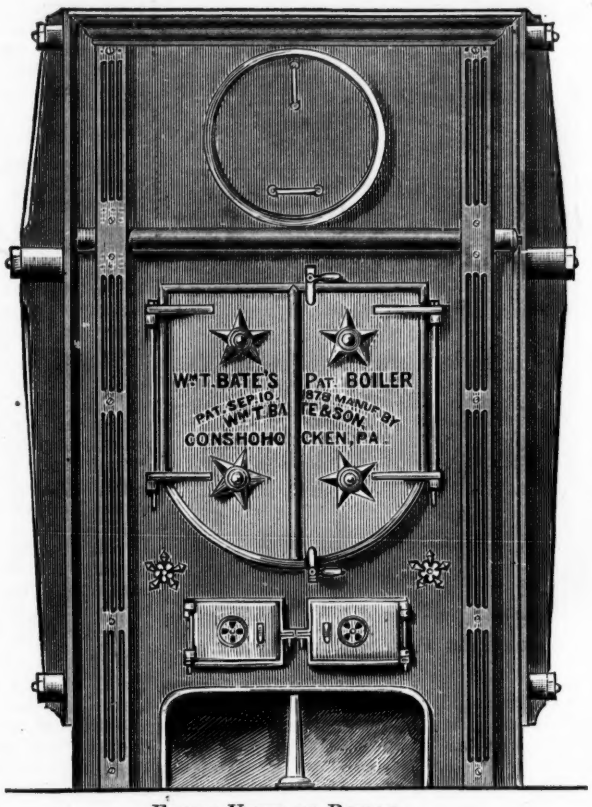
The "Muley" saw mills were becoming popular in much of the lumber region of Pennsylvania. It was usual to drive them at 280 to 300 revolutions per minute, by a belt, the engine having a long stroke and very moderate velocity of piston. A concern of moderate pretensions, in the valley of the Susquehanna, was engaged in making engines, boilers and mill work. They made a good many of the muley saw mills, and in 1850 or 1851 commenced building engines expressly for driving them by direct attachment to the crank shaft.

The cylinders had a bore of 7½ inches, and a stroke of 12 inches. An independent expansion eccentric and valve were used, cutting off at one-fourth to one third of the stroke. All the wearing surfaces were of liberal extent, most of them comparing well with approved practice of the present day. The cross-head pins were of steel. The days of steel valve stems, piston rods and crank pins had not yet come. There were blister steel, shear steel, cast steel and German steel, each with well-defined qualities and uses. American steel was along with American watches and American hardware, and those processes which have rendered possible steel rails and boilers and shafting were unknown. The intended boiler pressure was about 90 pounds. When an ambitious sawyer occasionally ministered to the quiet of the safety valve by piling on a slab, he might truly be said to be "going it blind," for pressure gauges were rarely used.

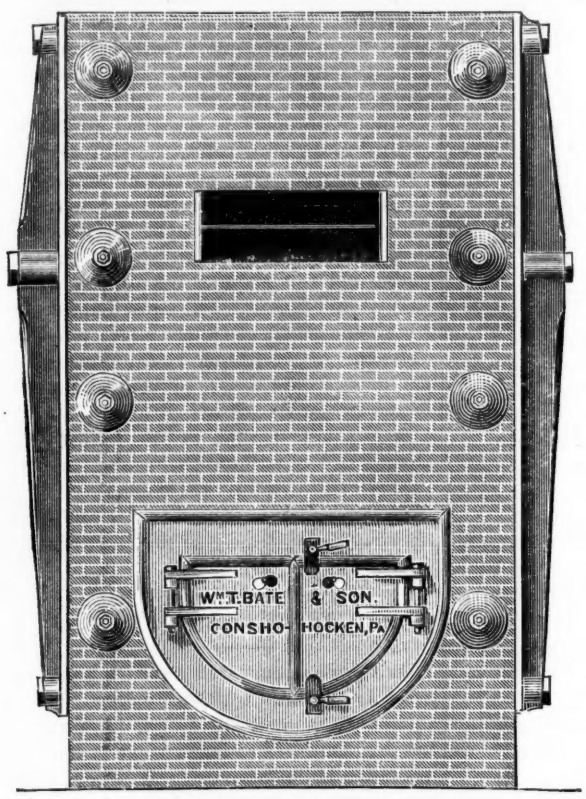
The engines were seldom run at less than 280 revolutions per minute, and frequently above 300. The value of the reciprocating mass, in distributing the work of the steam, was well recognized and considered. Many of the lumbermen and millwrights, however, were sure that, as one of them expressed it, "snaking all that iron back and forth so fast *must* use up a lot of power." The only argument available with these was the tangible one of lumber sawed compared with fuel burned.

These were difficulties. The mills being often built merely to work up the logs from a limited tract, the idea of permanence was apt to hold a secondary place. And so, solid foundations and intelligent care, both essential with high-speed engines, were rarely and with difficulty obtained. Yet the engines were successful to a degree which, viewing all the conditions from the standpoint of to-day, seems hardly possible. The probability that a 54-inch circular saw might some day be carried directly on the end of an engine shaft, making about 600 revolutions per minute, was freely discussed, the leisurely long stroke was voted a humbug, and the era of high-speed engines seemed to be opening. All the time, however, it was felt that, while their use in saw mills was a pretty severe test, a better field would be found, and their application to more general purposes was anticipated.

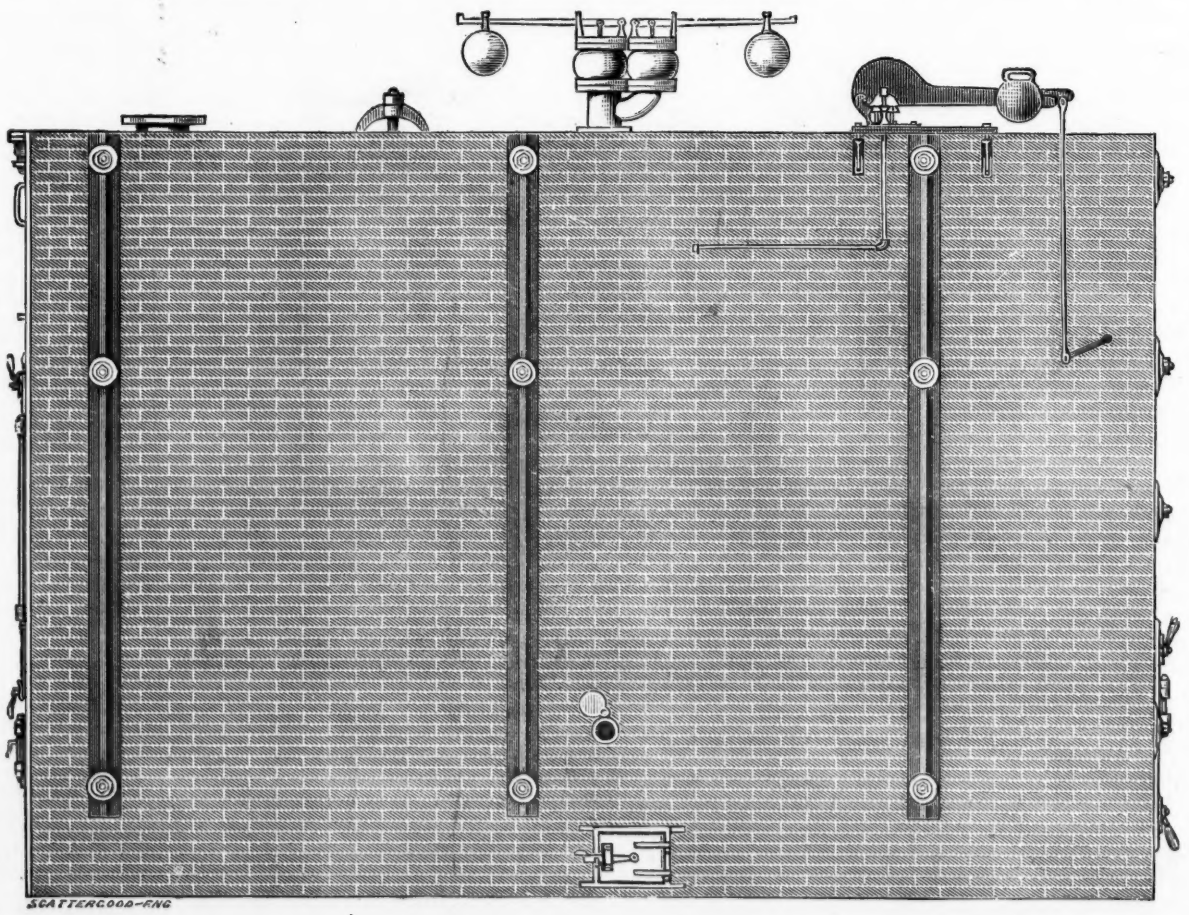
But changes soon occurred which turned the attention of those most interested in other directions; and so ended what at one time bid fair to prove an important chapter in the history of high-speed engines.



FRONT VIEW OF BOILER.



REAR END VIEW OF BOILER.



ELEVATION OF BOILER SETTING.

The First Iron Bridge.

The first iron bridge built for public use was designed by Robert Gregory, during his apprenticeship as a draughtsman in the employ of Abraham Darby, at Colebrookdale, England. When Gregory had served his term of seven years of apprenticeship, he was promoted as foreman of Darby's works. In 1775 the citizens of Broseley decided to build a bridge across the river Severn, and employed John Prichard, an architect of Shrewsbury, to prepare the design. The plan and specifications which he presented stipulated a key-stone of cast-iron. Upon enquiring of Abraham Darby if he could make the key-stone at Colebrookdale, they were answered in the affirmative; and more than this, Mr. Darby replied, "We can make the entire bridge of iron." In 1776 arrangements were concluded to construct the iron bridge, and the location was near Colebrookdale, at which point the river Severn was narrow, and the banks bluff and high. The bridge was built from the drawings of Robert Gregory, and constructed under his management, Mr. Darby giving personal attention to the abutment masonry and the erection. The bridge was erected in 1778, it being a continuous arch of 123 feet, and was opened for public use in 1779. In design and workmanship this bridge is probably not excelled by any structure of its class and size of modern engineering. It stands to-day, as it did one hundred years ago, sound and perfect in all its parts, although in constant use both day and night in carrying trains of ore, coal, limestone and metal to or from the neighboring works.

Robert Stephenson, in the "Encyclopædia Britannica" (8th edition) says of this bridge: "If we consider that the manipulation of cast iron was then comparatively in its infancy, a bridge of such dimensions was doubtless a bold as well as an original undertaking, and the efficiency of the details is worthy of the boldness of the conception."

Robert Gregory was buried in the village graveyard, near the Severn; but long since the slab that marked his resting place has disappeared. Now, when the traveler enquires for Gregory's tomb, the citizens of Colebrookdale point to the iron bridge across the Severn.

Improvements in Bate's Steam Generator.

In the March, 1879, issue of the AMERICAN MACHINIST, appeared a fully-illustrated description of a new steam generator, designed and built by William T. Bate & Son, East Conshohocken, Pa. This boiler has since been used in many large mills and manufacturing establishments with most satisfactory results. In order, however, to reduce the loss of heat to the smallest amount possible, Mr. Bate has added the steam drum shown in the accompanying engravings, besides minor alterations in bridge wall and other parts, which can be best understood by comparison of the former with the present illustrations.

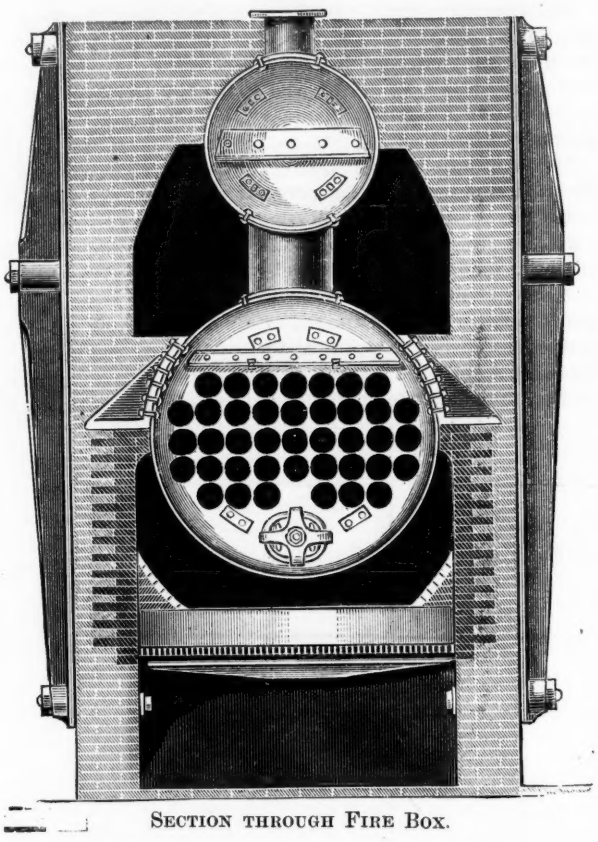
The following is the report of a test of one of these boilers in operation at the Blantyre Mills, Manayunk, Philadelphia. The test was conducted by Alfred Wilkinson, acting as consulting engineer. The boiler used in the test is 60″ diameter and 16 feet long, containing 51 four-inch tubes, and having attached to it a lower section 34½″ deep and 5 feet long, containing 32 four-inch tubes. This section is submerged in the combustion chamber behind the bridge wall.

The top boiler is 42″ diameter and 17′ long, surmounted by a steam drum, well covered with asbestos. The heating surface of this boiler sums up to a total of 1,301 sq. ft. The boiler furnished steam for a Corliss engine, cylinder diameter, 20″×48″ stroke, with a piston speed in feet per minute of 432.

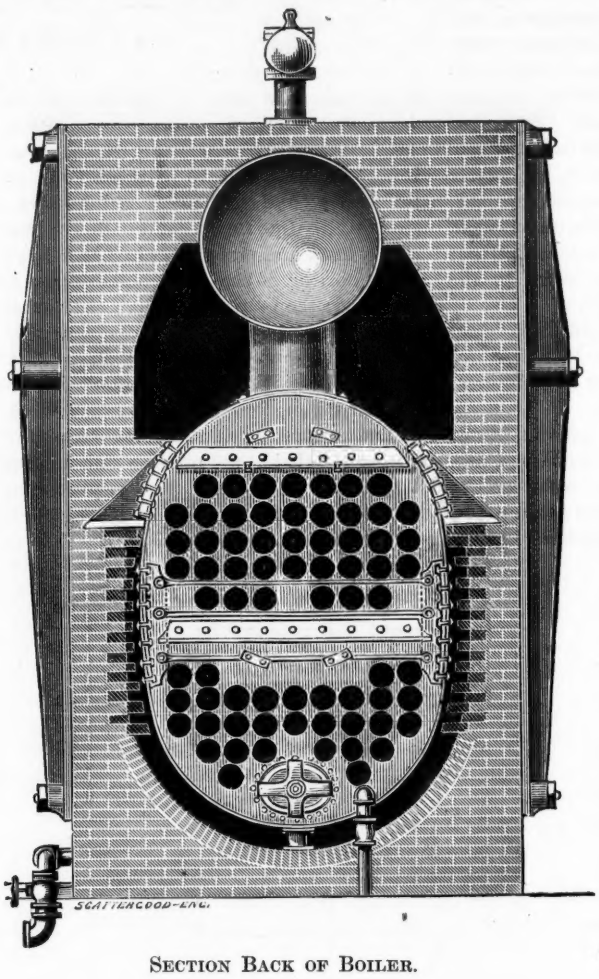
After noting particularly the water level, condition of the fires, and other details, the "test" was begun by weighing the water and the fuel, and applying the indicator to the engine. Indicator diagrams were taken periodically throughout the day, and show an average I.H.P. of 157, with a coal consumption of 4,623 lbs., and an evaporation of 49,073 lbs. of water, showing 10.61 lbs. of water to 1 lb. of fuel.

The engineer reports the water as practically evaporated in its entirety, but the boiler was working above its nominal capacity, and a large percentage of caloric escaped up the stack; owing to so great a velocity of draught, the damper was open continually.

From data furnished him of a former "test" of coal consumed with (2) two boilers and engine, performing the same relative duty, Mr. Wilkinson computes the evaporation to reach 14 lbs. of water per 1 lb. of coal, which is a somewhat astonishing result.



SECTION THROUGH FIRE BOX.



SECTION BACK OF BOILER.

LETTERS FROM PRACTICAL MEN.

Misconception of a Foundryman.

Editor Am. Machinist:

In a recent issue "A Foundryman" tells us that a foundry will use good iron for a time until a streak of economy strikes the proprietor, when he buys iron at $2 a ton cheaper. "In comes the poor iron and out go the bad castings." He furthermore expresses the opinion that this experience is met with twice a year in 75 per cent. of all the foundries of the country. Presuming that 75 per cent. of the foundry proprietors of this country are sensible men, they will accept advice when it is given to benefit their own pockets. If a foreman or moulder does his duty, he will come out in a manly manner and lay the case fairly before his employer. If he has a good reputation for uprightness, his advice is likely to be acted upon. If he is unable to do this, he is not fit to be foreman either in the machine shop or foundry, and, in justice to himself, his employer and his fellow workmen, he should step down and out, giving place to a more competent man. Again, he asserts that a pattern is often finished in the shop, and when the attempt is made to draw it out of the sand it is found that the draw holes have not been tapped. Would any intelligent moulder bury a pattern in the sand before he knew how he was going to get it out? I think not. Why don't that moulder examine the draw holes before he puts it in the sand? "A Foundryman" asks some pattern maker—a regular graduate from the best school—why he makes the core prints on the bottom of a hub straight? The "regular graduate" never does anything of the kind, as the querist ought to know. Furthermore, nobody but a stupid moulder would be foolish enough to try to draw a pattern small end first. I had thought to give a few practical hints in this letter, but a desire to economize space causes me to forego my purpose for the present.

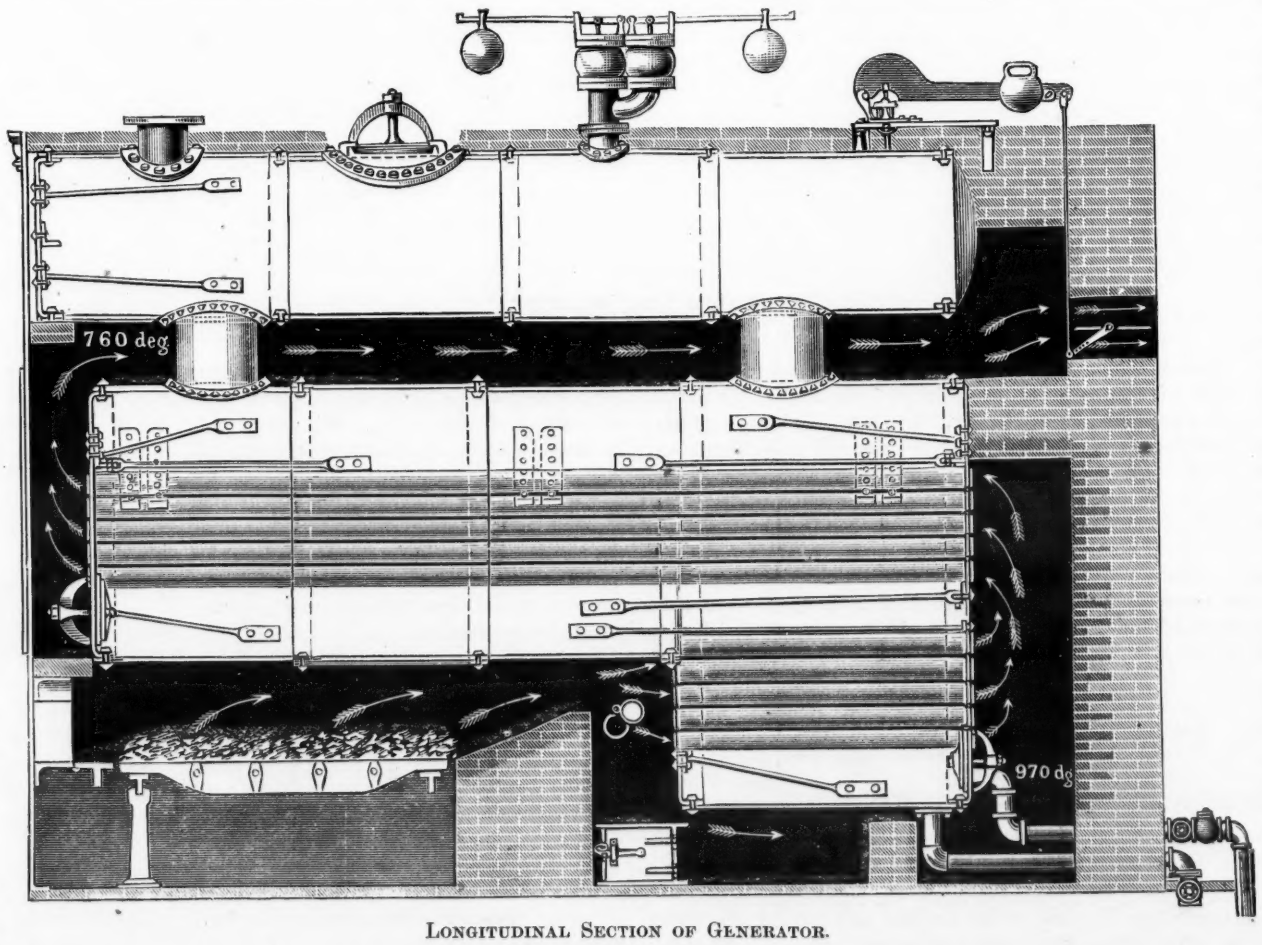
J. P. MULLIN.

Arlington, N. J.

Advantage of Long Bearings.

Editor American Machinist:

Not long ago I had some repairs to make on a pouncing machine used in a hat factory, and my attention was called to the bearings, the length of each being 12", and diameter 1¼". The boxes were lined with No. 1 babbitt metal. The most peculiar thing was that the shaft had but ⅛" actual bearing on each side throughout its entire length, and had been run about two years, at a speed of from 4,000 to 5,000 revolutions per minute. The bearings have never been hot, as I was informed, and have never given any trouble in any way. I should judge the boxes had been cast on a smaller piece of shaft than the one now in them, for if the same size had been used, the shaft would have had a more perfect bearing.



LONGITUDINAL SECTION OF GENERATOR.

Query: Why should this machine run for two years in the above condition and not heat, cut the shaft, or find a more perfect bearing for itself by the natural wear?

Croton Falls, N. Y. W. S. HARRIS.

Case-Hardening Mixture.

Editor American Machinist:

I know a much easier, cheaper and quicker way of case-hardening small iron articles, than that given by Mr. Harris in the AMERICAN MACHINIST of January 1, which is as follows:

Take ferro-cyanide of potassium (commonly called prussiate of potash), pulverize it and put it in a box two or three inches deep, and large enough to take in the largest piece you desire to case-harden. Heat the finished article to barely a red heat, and roll it in the powder in the box, being careful that the powder touches every part of the piece. Next, put it back in the fire and heat slowly and evenly to a cherry red. Plunge it in cold water, and the job is done. The thickness of the case-hardening will depend on the length of time it is left in the fire after dipping in the powder, and also on the quality of the iron. I have seen pieces of gun locks made of nail rod, that were hardened *through* almost as hard as steel could be made, but much stronger. I have used this process with the greatest success for all kinds of gun work, as it can be polished and blued afterwards, without injury to the case-hardening, and will hardly rust under any circumstances.

It should be noted that the fumes of the above mixture are highly poisonous, and must therefore be kept away from the mouth and nostrils.

P. JOSSERAND.

Hockley, Texas.

The Largest Milling Machine.

Editor Am. Machinist:

We notice in your issue of January 29th an article by Mr. John J. Grant, claiming for the Pratt & Whitney Company the honor of having built the largest milling machine in this country. We were aware at the time of sending you the notice that there were machines built for special jobs, capable of doing much heavier work than the one built by us. What we should have said, was, that it is our belief that it is the largest machine of its *class*, viz., the Lincoln pattern, designed for *general* work. We have at work in our shop a machine that will mill and feed automatically, over 5½ feet in length. The machine built by us weighs 4,200 lbs., measures 36 inches from end of spindle to back or supporting center, has a table 4 feet 8 inches long, 10 inches wide on working surface, and 12½ inches wide on bearing in carriage. The body of machine where carriage travels is 20 inches wide. The spindle has a vertical adjustment of 24½ inches.

Having given our figures, we would like to hear from Mr. Grant or any of your readers if they know of a machine that is similar and larger.

Cox & PRENTISS.

Cleveland, O.

Claims for the Fontaine Locomotive.

Editor Am. Machinist:

Some of the claims of the Fontaine locomotive, described in "Locomotives of 1880," in Jan. 15, issue, are, that the engine will run at a higher speed than the ordinary engine, with same consumption of fuel, and that the engine has no "dead points," etc. Evidently the first is not true, as the only effect of the friction wheels is to reduce the piston speed. For a given speed of the engine on the rails, high piston speed is not objectionable, and is, on the contrary, preferable, from an economical standpoint; and, evidently, to transport a given load at a given speed, will require the expenditure of a certain amount of power, whether it is developed by high or slow piston speed. In the Fontaine engine, either a larger cylinder must be used, or a longer point of cut off—both objectionable features, to say nothing of the extra friction due to the friction wheels. A few master mechanics, who have been building locomotives designed to run at higher speeds than ordinary, and who

have stuck to the old design of side rods, have found a little fault at the breaking of said rods and pins occasionally; but this is due to the fact that rods suited to a speed of forty miles per hour are not suited to sixty miles. Sixty miles per hour can be obtained, so far as the engine is concerned, with suitably-sized wheels, rods, pins, etc., with as much ease to the engine as thirty miles per hour; and with direct coupled engines, and the adding of any "gearing-up" device, such as the "Fontaine," is a step backward. The idea that by the intervention of any machinery whatever, the power as developed in the cylinder can be increased, is so absurd and so generally understood, that it is a matter to be wondered at that any one could be found to invest in the scheme.

The claim that the engine has no "dead points," is out of place, as any engine coupled at right angles, as are all locomotives, is also without "dead points."

The driving by frictional contact is not new, only as applied to the locomotive, and not exactly new there, as the contact of the drivers with the rails is the same thing, and the driving of one wheel by another in frictional contact is very old.

FRANK C. SMITH.

Delaware, O.

Boilers that "Bag" in the Middle.

Editor American Machinist:

I notice a statement by R. R. G. (4) in your column of Questions and Answers of January 29th, wherein he states that he believes a boiler 40" diameter, by 14 feet, will not last one-third the time of one 40" by 12 feet, and asks you to tell him why. Before looking for a reason or a theory for the above, we ask ourselves, is it really so? Is the statement warranted by experience? We answer most emphatically, No! It is absurd to believe, or to suppose for a moment, that by the addition of two feet to the length of a steam boiler we reduce its term of usefulness two-thirds. If this were true how long would a 30 feet by 40" boiler last as compared to one 12 feet long? Or, for comparison, how long would a 12 feet by 40" boiler last? We have in daily use a battery containing 5 boilers, 30 feet long by 40" diameter, generating 100 pounds of steam from the muddy water of the Monongahela, and has seen over twenty years of active service and is good for many more to come?

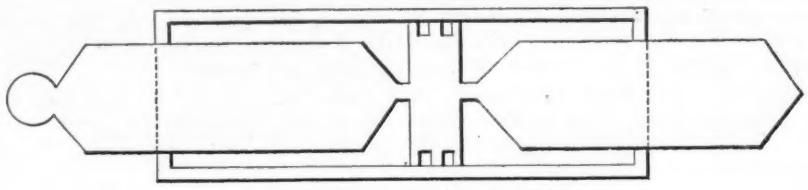
He also asks how a boiler may be burnt whilst having plenty of water in it. This is something that is very common in our rolling mills located on the banks of the river, the cause of which is that the scale on the shell of the boiler, which becomes loosened, or the sediment from the water (as the case may be) lodges upon a part of the shell of boiler over the fire. When this happens the sheet comes red hot and is forced out into a bag by the pressure within. The customary way to fix a bag, if not too large, is to drill a hole in the middle of it, and to heat it red hot by a charcoal fire urged by a hand bellows; then drive it back and put a rivet in the hole, if a large portion of the sheet comes down or is cracked; then a patch, or half sheet, may be necessary to a good job.

We have known boilers, at certain stages and conditions of the river, from which the feed was taken, to bag almost every week, and when there would not be over a pint of sediment settled at the point which caused the bag. Some of our mills are putting in filters in connection with their heaters, in order to avoid this trouble. We had a boiler bag twice, quite recently. The water used in it was heated in a Still-well heater, to 206° before entering the boiler. The cause of this "bagging" down was attributed to fine scale, which had become loosened from the under side of the flues in the boiler, and about one quart each time did the business. We remember an instance of a boiler, in a battery of six, "bagging" the first time they were fired. This was a surprise to every one, and, upon investigation, we found an old felt hat which one of the firemen had left in the boiler. This did the mischief.

"bags" down. Sometimes the "bag" is no larger than your hand; at other times as large as a hat, depending upon the amount of surface covered with the deposit of non-conducting material on the inside of the shell of the boiler. This sediment, or foreign matter, is carried by the circulation to the hottest part of the boiler, which is usually over the fire, near the bridge wall; and when a sufficient quantity is collected there to prevent the heat from passing through the iron to the water, the iron be-

MONONGAHELA.

Pittsburgh, Jan. 23, 1881.



A VALUABLE SPECIMEN PATENT.

A Valuable Specimen Patent.

Editor American Machinist:

Some time ago you illustrated an ingenious English patent for increasing the pressure upon a piston by corrugating it, and thereby getting an increased area for pressure. This is outdone, for real inventive power, by the patent issued by our own office in 1872 for a water motor.

The inventor says: "My invention consists in the arrangement of the piston rods for filling up the space in the cylinder, to economize water, so as to economize the water space and retain the same area on the piston for pressure."

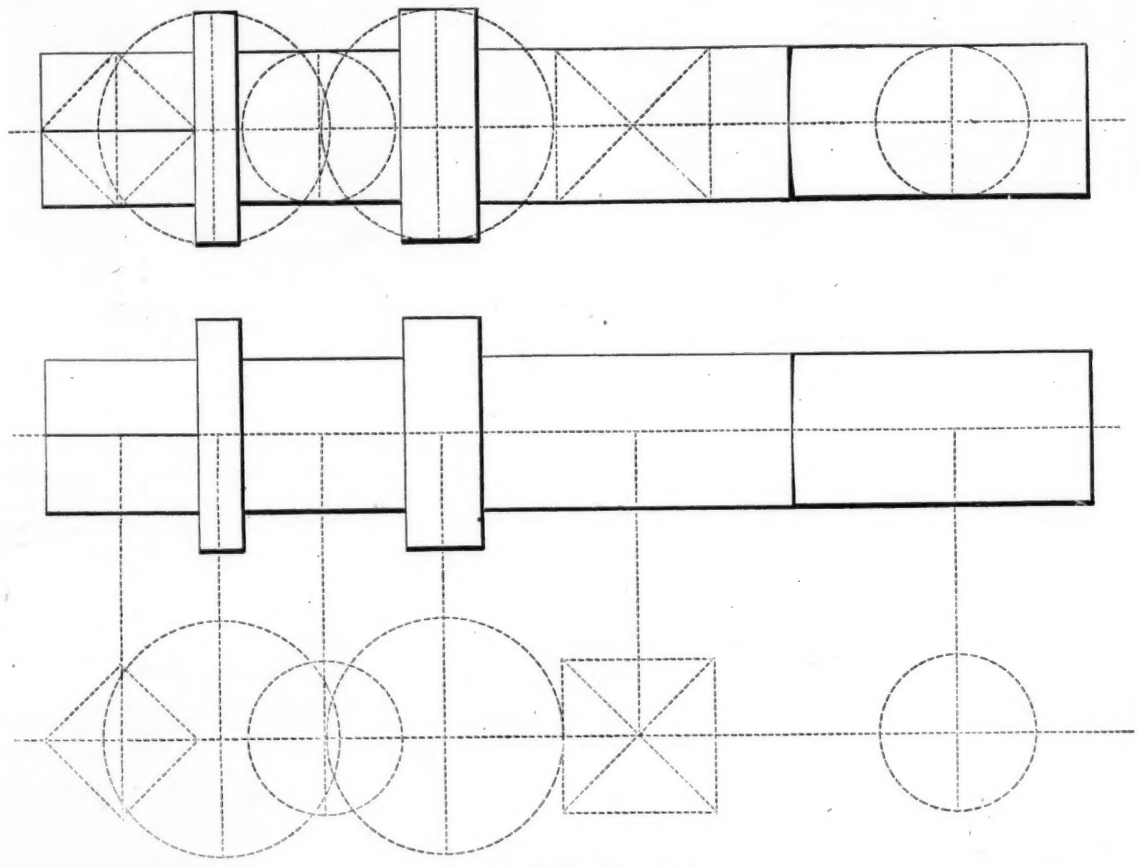
This is a good illustration of the thorough examinations made by the corps of expert examiners at the Patent Office.

It also illustrates the personal interest taken in the welfare of his client by the average patent lawyer. This patent was put through by a law firm that runs a scientific newspaper attachment to its patent business, and it is safe to say that they realized on the idea, if the inventor did not.

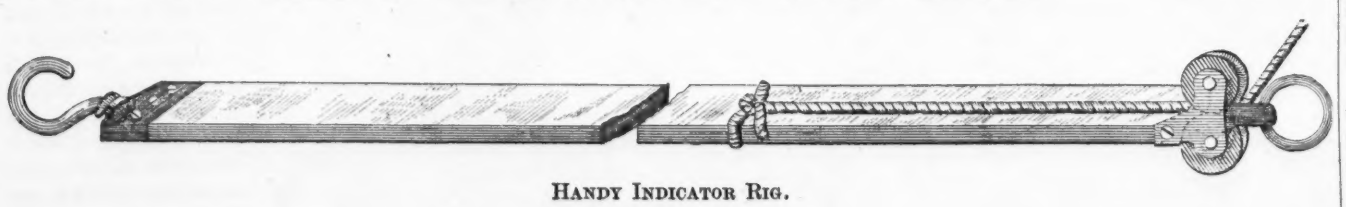
I am going to patent the idea of making the piston rods as large as the piston, and economize all the water. My patent will be for sale entire, and I should not demand any royalty on the machine sold.

We are a great and inventive people, and (the patent lawyers) make a boast that there are 200,000 patents in force (mostly like this one), and the crying need of the nation is cheaper patent fees (more patent lawyers) and more patents.

Boston, Mass. G. B. GRANT.



SHADED LINE DRAWINGS.



HANDY INDICATOR RIG.

Mounting Scroll Saws.

Editor American Machinist:

In your answer to F. H. S., of Williamsport, Pa., volume 4, number 5, in "Questions and Answers," you say that F. H. S. must counter-balance, so as to run steady at a fixed speed.

Now, I would suggest that, if F. H. S. wants a scroll saw to run as near perfect as possible, that he try the following method:

First: Make *all* reciprocating parts as light as possible. Second: Make the fly wheel as heavy as he can. Third: Counterbalance half the weight of the connecting rod only in the fly wheel. Fourth: Have the crank pin in the fly wheel.

Philadelphia, Pa. JOHN G. BAKER.

Shaded Line Drawings.

Editor American Machinist:

Noticing articles in your paper in regard to shaded and plain lines mechanical drawings, and as my views differ somewhat from the writers of those articles, I thought I would give your readers a chance to judge which is best.

A poor line drawing may be improved by shading; but a good smooth-line drawing can be improved in no way.

My method is to represent the bottom and right hand of globes, also bottom and top of cylinders, by a trifle heavier lines than the corresponding lines of a square, or angular object. The reasons for this are: that it gives the object more of the appearance of receding, and that reflected light is not as strong as direct light (which is well illustrated in the AMERICAN MACHINIST of Jan. 22, 1881, page 5 and Fig. 1), the light being supposed to fall over the left shoulder.

To preclude all liability of a misunderstanding between draughtsman and pattern maker or machinist, I represent by dotted lines on the center line of the drawings, or a center line thrown below a cross section of each differently-formed part, as shown in the accompanying drawings.

D. M. CARTER.

Watertown, N.Y.

A Handy Indicator Rig.

Editor American Machinist:

In my leisure moments, when I have nothing better to do (which is seldom), I look over my two volumes of the AMERICAN MACHINIST and re-read its numbers. I could not but feel impressed with Chordal's complaint: "Oh, for a handy rig to carry around;" and so I think I will venture an idea that will relieve his distress. He can roll this up, put it in his pocket and go through the public streets without being taken for a carpenter.

Of course, I only offer this as a suggestion for experiment, as I have never tried it, but I think it might prove practical. Take a wide and rather thick piece of vulcanized Para rubber. It should be of sufficient sectional area to wholly overcome the tension of the spring in the drum, and should be of sufficient length to stretch the length of the stroke of the engine. At one end pulleys should be placed to guide the cord; at the other should be a hook to fasten on some part of the engine. The mode of operation is as follows: Suppose we hook on to the cross head, we would take hold of the other end of the strip of rubber and attach it to some stationary object about the engine, only being sure that the rubber was under tension at all times.

As the elasticity of the rubber is the same in all its parts, the amount of motion in any portion of its length varies—from rest at the stationary end to the full length of the stroke of the end at the cross head. So we have but to attach the cord to some certain portion of its length to get the right motion of the drum on the indicator.

Impure rubber may increase in length under repeated stretching, but the amount of error in one motion of the drum would be imperceptible.

If this principle would work, it would offer these advantages: First, it is compact; second, it can be rolled up and easily carried; third, it can be attached to the engine while it is running; fourth, it can be easily attached to any part of the engine, and

hitched anywhere by a small rope; fifth, the cord can be attached while it is moving without danger to the hand; sixth, it is light.

As pure rubber will stretch four times its length, it should be a strip one-fourth of the stroke of the engine.

A piece two feet long would be suitable for any engine under eight-feet stroke.

Dorchester, Mass. ISAAC H. DAVIS.

Progress in the Arts.

Editor American Machinist:

In the old method of melting glass it required 1½ pounds of coal to melt a pound of glass; in Germany, where coal is expensive, the glass manufacturers claim to be able to melt a pound of glass with a pound of coal. There are glass-melting furnaces running successfully in Pittsburgh, which melt seven pounds of white glass for table ware with one pound of coal.

The old method of making eye bars for bridge links was by forging the eye under a steam hammer, and then welding one of these eyes on each end of a parallel bar. This was improved by forcing or upsetting the ends of parallel bars by means of a hydraulic ram. Now we have a universal mill in Pittsburgh in which the eye bars are rolled to shape in one solid piece.

The old method of cutting cast steel to length was by nicking the bar with a cold chisel, then breaking it, and then dressing the end by chipping, grinding or filing, or by heating in the smith shop. We now use the Fusing Disc in Pittsburgh for such work; it does the work in one-tenth of the time, and leaves the ends as smooth as a looking glass.

Twenty years ago steel castings were scarcely known; ten years ago but small-sized castings were made. We have now in Pittsburgh a steel foundry making steel castings as heavy as five tons each; and a new works is now building which will have the capacity of producing a single casting weighing ten tons of soft steel, as tough as wrought iron.

Ten years ago a blast furnace which would make 400 tons of metal per week on 600 tons of fuel was considered a big thing. We now have blast furnaces in Pittsburgh which produce 1,500 tons of metal per week on less than 1,500 tons of fuel.

The old method of heating permitted the flame to pass out of the furnace stack at a temperature of 3,000° F. We are now using the regenerating stoves in Pittsburgh, and don't let the gases out until we have utilized all the heat except 300°.

The old method of making steel shafting was by turning round bars of steel in a lathe. We now have burnishing machines in Pittsburgh, which work automatic and finish 2″ steel shafting from the rough bars at the rate of one foot per minute.

JACOB REESE.

Pittsburgh, Pa.

Shaded Drawings.

Editor American Machinist:

To shade or not to shade, "that's the question." Mr. Webber, in his article in your issue of January 22d, admits in his preamble all that I claimed for shaded drawings, and as I particularly mentioned varnished drawings, and recommended working drawings upon thick paper board as advised by Chordal, his remarks, therefore, about tracings and the heliographic or "blue print process," as applied to my article are irrelevant.

The engravings show and fairly present the subject to your readers (who are the jurors in this case) so clearly, distinctly and unmistakably that I have no chance to "talk back," but submit the case without argument. T. SQUARE.

Pittsburgh, Pa.

Another Moulder Replies to Criticism.

Editor American Machinist:

In your issue of Dec. 4, 1880, there appeared a communication attacking the iron moulders, for their inability to make good castings, from some one who does not have the spirit to come out under his true name and give us a chance to know who he is, as then we would be able to judge what he knows of his own business before he undertakes to make corrections in ours. He has led himself to believe that moulders do not read any scientific works. Poor man! For his edification, let me tell him I can produce works written on metallurgy by moulders that would do honor to any body of mechanics; and further, I can give him the names of ten iron moulders here, in one shop, who take the AMERICAN MACHINIST, and not one machinist. That says something in favor of men whom he would ridicule as not knowing their business, or, as he says, never read any papers on mechanics.

He says he would return any bad castings for moulders to make good at their own expense. If the rule he would adopt for moulders was resorted to in machine shops, the machinist's trade would soon require an addition of would-be machinists. I know a number of machinists who are as incapable of doing good work at their trade as the most inferior moulders I ever worked with. The machinists I refer to were not even as good as the women he compares moulders to, and who would always frame some excuses for making bad bread.

Let him give his real name, and not get behind a fence to hurl stones, without giving some better cause than his letter of Dec. 4 does. If his brain is over-loaded with such an amount of the knowledge of moulding, why can't he, like a good Samaritan, give us something a little more edifying?

M. A. KANE.

Dartmouth, Nova Scotia.

Drawings—Projections—Some Conventionalities.

Editor American Machinist:

Not wishing to weary your readers with a further prolonged discussion of the projection question, I will say but few words in reply to Mr. Falkenau in No. 3. I assure him that the pleasure of a discussion with one so genial and courteous is reciprocal, and hope future occasion may arise for another tilt in the mechanical arena. On *projections*, we both seem to hold the preferences we started with, but each is willing to acknowledge that the other's method is good for those who are accustomed to it, and that either system will answer the purpose when some competent authority shall make it a standard.

Until such time we must all be careful to distinctly mark the different views of a drawing, where other workmen than those of our own training may have it to interpret. Many a valuable pattern or piece of a machine may be ruined by its maker not knowing which way the drawing was "revolved." This is not apt to happen on large expensive "full drawings," where it pays to write numerous explanations, but rather on details—especially if they are not for standard work, and are of a somewhat temporary and sketchy character, with perhaps a good many crowded on one sheet.

Regarding the practical advantages that Mr. F. speaks of, as having been suggested by Mr. Sellers, I would say that I had some time since, in correspondence with Messrs. Wm. Sellers & Co., learned that their views were of the same tenor and effect. As regards having the important elevations on the lower edge of board, I do not see that it is an advantage unless the drawing is very large and habitually kept very high up. If it happened to be supported on or near the floor the reverse arrangement of views would be better. The other argument of Mr. Sellers—regarding placing the view of a certain side of an object adjacent to the edge from which it is derived on the primary view, in order to avoid *long projecting lines*, is the only one yet advanced which seems to me of practical value. Even this applies only when the drawing is quite large and when the secondary view is an elevation. If it happens to be a vertical section, it is very likely to be taken through the center of the primary view, and it would be as near to project it one way, as the other.

The writer has never found any trouble from the above-mentioned source, but it may be because he has largely made use of a special paper, ruled at right angles in faint lines of different shades at every 1″, ½″, ¼″, and ⅛″.

To what extent this "scale paper" is used among machinists I do not know, though ruling to various scales is common enough among civil engineers. Its great utility, as a time saver, and an aid to correctness in designing, projecting and transferring machine drawings (either in the same or a different scale) no one who has ever used it will call in question. Its convenience to the workman in *reading* drawings is also very great, as it carries its measuring stick on its face, regardless of the hygrometric condition of the paper. In many kinds of work I would as soon think of doing without this ruling as a map man would without his lines of latitude and longitude. I will not go further into this matter now, but at some future time, should you desire it, may have an opportunity to give you a detailed description of a carefully studied system of drawings, indexing, and symbolism in use at our works.

One foolishness frequently indulged in by draughtsmen is a mild effort to make their drawings look like a Harper's Bazar pattern-sheet—one of those wonderful documents, comprehended only by the wiser sex, in which several million maps of Boston seem to be interwoven in hopeless confusion, each supposed to be drawn in a different kind of line, and all the lines very much like the Morse alphabet—except those that look like Virginia rail fences and rows of raspberry bushes. This confusion is effected (1st.) By trying to show too many of the invisible parts of the object through the visible parts, by a mass of dotted lines, and (2nd.) By numerous dotted lines connecting each pair of "pointers" to indicate the lines of measurement. The first evil can be mitigated by drawing only such hidden parts as are absolutely necessary to show their relative position to the visible ones—depending upon auxiliary views for the rest. Of course these dotted lines should be in the same color (preferably black) as the rest of the drawing, because they are a representation of a part of the object. The second evil can be remedied by omitting the measurment lines in nearly all cases, but where they seem positively necessary by placing them *out side* of the object, with proper "projecting lines" between which to place the pointers. A person accustomed to using them freely will be surprised to find how easily they can be abandoned, merely by a judicious placing of the pointers and measuring figures, so they shall not interfere or be mistaken for each other. Of course the projecting lines, pointers and figures (also measurement lines if there be any) should be in *red* ink, though too many draughtsmen pay no attention to this point. A sad exception to the red ink (and also to various other desirable things, such as fine lines, surface shading with pencil, crayon or brush, coloring of various kinds, etc., etc.,) has to be made when that invention of modern barbarism, *blue print*, is deemed necessary. Now blue print is undoubtedly in some cases an evil necessity to our fallen natures, but may heaven soon send us some new invention by which we can duplicate our drawings as we *want* them made, and which will not force us to put everything into dead black lines and get our copies in blotchy, whitey-blue.

The above-mentioned fault of a confusion of lines and markings can hardly be dignified with the name of a conventionality; it is rather a bad habit with certain people. A true conventionality, however, of the bluest orthodoxy, is drawing heavy shade lines on two adjacent sides of an object. These are of no practical use whatever, and are wholly pernicious; because, 1st, they prevent accuracy, it being doubtful in many cases which side of the thick line the measurement extends to; 2nd, they are expensive to make, especially in curved work; 3rd, they mar the beauty of the drawing. I am aware that all this is rank heresy, and that the conventional school will say the shade lines make, not mar, the beauty sought for. This is true for art work, *e.g.*, in such as Flaxman's designs illustrating Cary's "Dante," where an outline picture must hint at the effect given by a fully-shaded drawing. In art work the main purpose is to deceive the eye (else why perspective?), and produce the appearance of the actual object with all its surroundings, and the tricks of light and shadow upon the flat paper or canvas. In the working drawing of a machine the purpose is, on the contrary, to give a memorandum of actual shapes and measurements in the plainest form. If it were a true picture, it would have no outlines—only color and form. As it is, the outlines are the most important parts, limits of measurements, and should, therefore, be as near as is consistent with seeing them plainly to the mathematical definition of a line—without thickness, etc. This, of course, includes uniformity.

For utility as well as beauty, all drawings should have shading, but not shadows. Not shadows, because they are useless, and their profiles only make confusion among other shapes represented. The mechanician cares not whether the light was "supposed to fall from a point 45° from the top and left," or from the North Star, or whether there was any light. If he supposed about it at all, he would be likely to think of the diffused, non-shadow-casting light that ought to shine in a well-regulated draughting room.

The matter of shading is entirely a different thing. Surface shading is an easy and natural conventional method of indicating the shape and material of the parts presented toward the eye. In section shading, the parallel diagonal lines have their analogy in a sawn-apart plane surface. In either case the shading should be much lighter in color than the outlines, both that the latter may stand out distinct for reference, and that any red figuring, etc., may show plainly upon a not too dark background. In this respect, also, it differs from art work, where the darker shading merges into the lines.

In speaking of "art" as a matter separate from mechanical drawing, I do not wish to disparage artistic work. In designing a machine, the utmost attention should be paid to inherent beauty of form, combined with fitness for its functions. The drawing of the machine should be artistic so far as neat and careful workmanship is concerned; but it should try to be what it is—a graphic tool with which to construct and describe the machine to the best possible advantage. It should not try to be what it is not—merely a beautiful picture.

From the tenor of the above it will be readily surmised that I have no sympathy with the horrible shadows and enormous shade lines shown in the cut on page 5, No. 4, Fig. 3. It would require a wonderful workman to comprehend, without special instructions, that the uncanny shapes there shown had nothing to do with the shape of the object to be made. How to accommodate surface shading to the blue-print process is, however, a problem. Line shading is objectionable because the lines may, in some cases, be mistaken for boundaries of shapes upon the object. Perhaps some sort of "stipple" work would answer, considering the fact that a collection of small dots is not common on drawings—except in the rare case of nutmeg graters. OBERLIN SMITH.

Bridgeton, N.J., Jan. 20, 1881.

A leading manufacturer in the stove-foundry line says all the other men in that business, except himself, are crazy regularly twice a year. In June they are crazy because they have such large quantities of goods on hand unsold, and fear some will remain unsold throughout the season; while in December they are equally crazy, because they have no more stoves with which to fill orders. When are the machinery men crazy?

The recent advanced prices of machine tools make purchasers more anxious than ever to get their orders placed before there is any further advance.

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NEW YORK, FEBRUARY 12, 1881.

CONTENTS.

PAGE.

New Stamping Mills..... 1
Development of the Iron Business..... 1
Some Suggestions to Apprentices..... 2
Adjustable Pipe for Fire Hydrants..... 2
Miners Prospecting Compass..... 2
The Basic Dephosphorizing Process..... 2
The Car Wheel Question..... 2
Shop Kinks. No. 5. L. F. Lyne..... 3
Combination Faucet for Excluding Sewer Gas from Houses..... 3
New Hand Lathe..... 3
Newly Incorporated Companies..... 3
High-Speed Engines.—A Reminiscence. By A. B. Couch..... 4
The First Iron Bridge..... 4
Improvements in Bate's Steam Generator..... 4
Letters from Practical Men—Misconception of a Foundryman—Advantage of Long Bearings—Case-Hardening Mixture—The Largest Milling Machine—Claims for the Fontaine Locomotive—Boilers that "Bag" in the Middle—A Valuable Specimen Patent—Mounting Scroll Saws—Shaded Line Drawings—A Handy Indicator Rig—Progress in the Arts—Shaded Drawings—Another Moulder Replies to Criticism—Drawings and Projections..... 5, 6, 7
Imperfect Methods of Selling Machinery..... 8
Placer Mining by Steam..... 8
Iron and Wooden Shipbuilding..... 8
How to Spend Evenings..... 8
Co-operative or Assessment Life Assurance..... 8
Hurried Stock Taking..... 9
Literary Notes..... 9
Questions and Answers..... 9
Manufactures..... 9
Machinists' and Engineers' Supplies..... 10
Iron and Metal Review..... 10

Imperfect Methods of Selling Machinery.

One of the most imperfect is the vicious system of sending out machinery on thirty or sixty days trial. Eagerness to get orders from half-convinced customers is, of course, usually at the bottom of the error. If a machine possesses no special element of novelty in principle, a proposition to place it on trial in this way is wholly unnecessary, for the reason that its practicable working ought to be fully assured without such "trial." If the machine offered for sale is entirely novel, and yet worthy to live and hold a permanent place in mechanical construction, it should have merit enough, either of accomplishment or economy, or both, to induce a careful consideration of its claims sufficient to make "trial" of this sort unnecessary. No purchaser need lack competent mechanical advice in this mechanical age, and the maker of novel machinery who stands squarely to his guns, and insists that his machine must be examined and bought upon its merits, will, in a majority of cases, carry conviction of its substantial merits in a way that can never be done by weak-kneed cringing. Such machines, when bought, are sure to be tested more fairly than trial machines, and there is then no excuse for postponing payment for three, six or nine months, as is commonly the case, in the fear that some imperfection may in time be developed.

Another error, on the part of persons engaged in making and selling machinery, is the habit of addressing their persuasive appeals mainly to the actual purchaser.

Said a manufacturer of steam boilers recently: "When I approach the owner of the establishment in which I hope to place one or more boilers, I am told by him in a majority of cases, that he knows a good deal about carpets, or drugs, or dry goods, or what not, but very little about steam boilers, and all that sort of thing. In nearly every instance, I find the sale is made or marred by the man who runs the engine and boiler, or by some engineer or mechanical expert, whose advice is finally taken." The statistics of almost every shining success in mechanics will show that the chief effort of its promoters has been to get mechanics generally to appreciate its merits, making the actual getting of orders a secondary, though important object.

Akin to this suggestion is the indifference which some manufacturers feel for the future influence of students at technical schools. Such manufacturers are prone to think the catalogue thrown away, which some bright student manages to squeeze out of them, forgetful of the fact that the mechanical sentiment and industrial development of the future will, some day, be largely dependent upon these eager young inquirers and experimenters. Doubtless there are to-day single apprentices in shops whose individual influence will develop into enough business to run many a good-sized shop.

Another error which many men fall into, in attempting a sale, is that of instituting in advance needless comparisons with other appliances for the same or some similar purpose. The usual result of this method is to convert the wished-for purchaser, by force of rebound and a desire for fair play, into a sympathizer with the existing or rival appliance. The salesman who, so far as is possible, refrains from such comparisons, and dexterously leads the customer into finding out for himself the advantages of the proposed mechanism, is usually the man who can be relied upon to bag the most and the best game.

Another method, in particular, by which mechanics spoil their chances as salesmen, is by setting themselves up for universal geniuses in mechanical matters. If the proposed customer is a mechanic, he does not enjoy the sense of inferiority at all points which is thus gratuitously forced upon him. If he is not a mechanic, he is far more likely to give the manufacturer or inventor credit for great skill in some particular department, as a result of years of special study and experiment, if wisdom is duly tempered with modesty in that and other matters.

Many men defeat their chance of consummating a desirable bargain by leading the customer too rapidly or promiscuously over the points involved, and thus befogging the case at issue. Logical sequence in the mind of both buyer and seller is equally as important as the corresponding quality in the parts of a tool or machine. In many establishments it appears to be the prevalent thought that to make—is all; to sell—nothing. It is safe to say that both directions should be equally and assiduously cultivated, and that without a fair development of appliances for the latter, the full development of the former department is impossible.

Placer Mining by Steam.

Our adventurous friend and esteemed contributor, Samuel S. Webber, well-known to readers of the AMERICAN MACHINIST, having arranged his California matters, has set up business as a sort of moral pirate, having sailed as mechanical engineer of a mining expedition for the Atrato River, South America, on the north coast of the United States of Columbia. His vessel carries a steamboat and a steam launch, with complete propelling and mining machinery, the object of which is to suck up from the bottom of the river the rich placer deposits believed to be there beyond the reach of hand labor. The machinery which is understood to have been designed by Mr Webber, has, it is said, been successfully tested, bringing good sized rocks up from the bottom of the water.

Iron and Wooden Shipbuilding.

The position of iron shipbuilding in this country, although limited, virtually, to a few establishments on the Delaware, is by no means so trifling as many newspapers would have their readers suppose. All well-equipped iron shipyards are full of orders, and there is every reason to believe they are doing a profitable business. An oft-repeated assertion that large iron vessels cannot be constructed in this country with both pecuniary and mechanical success, is entirely unfounded. The high cost of labor and materials, as compared with their price in England, can be offset by the same ability and surpassing enterprise that enables our manufacturers to compete so favorably with British goods in foreign markets. Yet the advantages for building iron ships, in competition with the English, are somewhat different from those possessed by manufacturers of articles for stationary use. Our ocean-carrying trade can be, and mostly is, done in foreign bottoms, but our internal industries cannot be under foreign control—at least while a protective tariff remains in force.

As iron and steel for constructing, and steam for propelling, vessels are rapidly superseding wooden-built and wind-power-driven ships, there would seem to be some good openings for ambitious capitalists and business men to start a few iron shipyards in the vicinity of New York City. We are credibly informed that there are now eighty iron steamships on the stocks in course of construction in Scotland, none of which are less than 3,000 tons burden, besides a great many others of smaller capacity. All the large shipbuilding establishments in Great Britain seem to be full of work. On the other hand, the building of wooden vessels in Maine has been steadily declining. During the year 1880 ninety-two vessels, with an aggregate tonnage of only 35,847, were built in the State. This was less than half the tonnage of 1877, since which there has been a decline every year. It is useless to try to bolster up such an industry in the face of the much greater favor with which iron vessels are regarded. We should not be so far behind our British cousins in this very important industry. There is a growing demand for iron river and excursion boats, which alone will sustain several shipyards.

How to Spend Evenings.

Every machinist who desires to advance himself, become a master of his business, and a designer and director of mechanical work, should improve these long winter evenings in studying draughting. It is not strictly necessary to have an instructor. Many a successful mechanical engineer can trace his rise and progress back to the time when, a journeyman, he bought a good book on draughting and delved into it with pencils, drawing board and instruments at hand, determined to acquire a practical knowledge of its principles and applications. Unless a mechanic knows something about drawing, he cannot fix his ideas in such a graphic shape as to preserve them to build upon, or make them plain to others when it is desired to do so. There is a very lively demand for competent draughtsmen just now, which is likely to keep up indefinitely. A skillful draughtsman is master of his own original mechanical conceptions, not having to go to another to get them put into shape for permanent preservation.

A few days ago a prominent mechanical engineer related to us that he once had a bright young machinist working for him who spent most of his evenings in a saloon, and who made no especial progress at the trade. One day, noticing something that showed the aptness and natural ability of the young man, he said to him, "You have no business here at the bottom; why don't you go to the top?" Somewhat surprised at this question, the machinist asked in return, "What shall I do to get there?" The reply was that he must abandon the saloons, give up his evenings to the study of mechanical drawing and good books on mechanical subjects, and as soon as possible commence to experiment in a small way. He did so, and, to use the words of our informant, "in three years he was at the top, and has remained there ever since." We will add that he has designed some very successful machinery which is now regularly built under his direction, and that his name is familiar to readers of the AMERICAN MACHINIST, by reason of several excellent articles which he has contributed within the past two years.

Those machinists who expect to reach the top must make a start some time, and not wait like Micawber "for something to turn up." Perhaps the best opportunity most of them will have is that afforded by the present long winter evenings. Those who do make a start in this way usually surprise themselves by the rapidity of their progress.

Co-operative or Assessment Life Insurance.

In our issue of September 4, 1880, we published some details regarding the workings of a co-operative assessment beneficiary society, as they came to our knowledge, having in mind the special advantages which might accrue from a similar organization, if established among men connected with machinery trades. The society described combined social intercourse with beneficiary objects, and should a machinery organization be formed, the discussion of mechanical topics might perhaps be appropriately indulged in at its meetings. The conditions of admission to the society should, of course, be essentially physical.

The special organization to which our remarks apply was established two years ago, and had January 1st, 1881, over 550 councils and 26,000 members. In the year 1880 there were 89 deaths, and six assessments for the Widows' and Orphans' Benefit Fund.

In pursuance of this topic, we quote an interesting calculation regarding the length of life which such a beneficiary society might reasonably hope to attain under reasonably favorable circumstances. The extract is from a paper read by Alexander Gardner, of Washington, D. C., at the fifth annual Convention of Mutual Benefit Societies, held at Erie, Pa., some weeks since. We quote:

This idea of the age of the membership increasing rapidly, with its consequent increased mortality rate, has been a common and favorite form of argument used by the opponents of the assessment plan associations; but to Mr. Welch, I believe, belongs the honor of the discovery that it will increase in geometrical ratio. It seems never to have entered into the minds of these skilled mathematicians and actuaries that, like a community or country, there is a time and age beyond which the total years of an association will never increase; it will then have attained its maximum average age, and, consequently, its maximum average mortality rate. To determine this does not require a vast amount of algebraical or arithmetical skill; the four ground rules, and not much of them, will do; for whenever the total number of years of those who fall out of an association equal the total number of years, those who have grown older, who remained in the association, together with the total number of years of those who come into it, you have arrived at a point where the average age will remain stationary. Let me illustrate by taking an association of 1,000 members at age 30 years, and that, between deaths and lapses, 100 members drop out annually, and that the lost members are replaced by 100 new ones, at age 30 years; at what age will the association have reached its maximum average age? We take in 100 members at age 30, representing 3,000 years; the 900 remaining members have become each one year older, representing 900 years, which, added to the 3,000 years of the 100 new members, gives a total of 3,900 years; deduct from the 3,900 years 3,100 years for the 100 members that fall out at 31 years of age, and you have 800 years to add to the total years of the association. Go on repeating this process, and the average age of the association will gradually increase till you reach 39 years. At 39 years of age, 100 members will represent 3,900 years, and you can go on until Gabriel blows his horn, adding 3,900 and deducting 3,900, but the average age of the association will never grow any older. For simplicity of illustration, 10 per cent. has been assumed as the number dropping out. It makes no difference, however, what per cent. is taken, the result will be similar.

Hurried Stock-Taking.

During the past three weeks, attention has been devoted to the subject of stock-taking in a great number of manufacturing establishments. In ordinary years this necessary preliminary to the new year's business has a chance to receive its due measure of notice. But the business conditions have so materially changed during the past eighteen months, that the pressure of present business and the demands of orders unfilled, have cut off at both ends the time that should be devoted to stock-taking and reckoning, and to the several morals that should be pointed out in consequence.

As a result, many items representing the value of tools and equipments will be included at last year's valuation without regard to the year's wear and tear. Many accounts on the books will be accepted as good, which a closer inspection would show to be already scheduled above their value. Many articles in the shape of new products on hand unsold, will be rated at an incorrect figure, for lack of time in which to properly get at the truth. Many establishments will think they have made more money than they really have, because the figured data on which they work are imperfect. Many men will enter upon imprudent expenditures for the future, in consequence of these short-comings, who would do well to make haste more slowly.

Some establishments, tired of paying the increased rents that are likely to be demanded of them, will burden themselves with debt, or lock up large portions of their available capital in the purchase of ground and erection or purchase of buildings, who would have more wisely paid attention to the figures, which this year they have been too ready to take for granted. On the other hand, many establishments will conclude, on insufficient study, that they cannot afford to purchase new and improved tools on account of the large amounts standing to tool or machinery account on their books, representing in the main, tools that have been practically superseded by better devices.

Many establishments, by examining their time books for the past year, also, can collate many interesting figures, regarding work and workmen, that should have a place in the annual stock-taking. There are many shops in which health and fire-risk, if properly considered, would add items of interest in this connection.

So much for the shop. But what stock-taking, hurried or otherwise, have the workmen, each for himself, been making during the past three weeks? The workman who finds himself no better off, financially or mechanically, or socially, or physically, or mentally speaking, as a result of his past year's labor, would do well to season his meditations during the first few weeks of each year, with a little of the inventory duty, which his employer never omits to do, if he is wise.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) A. O. B., Brooklyn, N. Y., asks: Can you tell me how to make bleached shellac dissolve in alcohol? I have shellac which, when I bought it several years ago, dissolved readily enough. Portions of the same lot seem now to be utterly alcohol proof, having calmly lain submerged, under varying circumstances of heat and cold, for three months. A friend who bought some new bleached shellac lately, was quite unable to make it dissolve in alcohol, either hot or cold. *A.*—The behavior of the shellac and alcohol proves one of two things—that either one or the other is impure, perhaps both, alcohol being the proper solvent of shellac; or, the condition in which the shellac has been kept has injured its quality. If the alcohol is 95 per cent. it will dissolve pure shellac at any time. Please send us specimens of the alcohol and shellac referred to for tests to determine their purity. If any of our readers have had a similar experience to the above and have discovered any kinks, we would be pleased to hear from them.

(2) S. M. T., Rahway, N. J., writes: 1. I have read your valuable paper for nearly a year with great interest and profit, and now venture to ask you two questions. In your issue of March 6, 1880, in the description of the Leavitt pumping Engine, is the following formula: Duty of Engine: ft. lbs. per 100 lbs. of coal.

$$\left(\frac{536.0465\times8\times12,337\times76.6\times100}{3.633.}=111,548,925.\right)$$

I don't understand why 12,337 is used as a factor of the dividend nor why $\frac{3633}{1000}$ is used as a divisor. *A.*—12,337 represents the total number of revolutions of engine. For 3.633 read 3,633 and not $\frac{3633}{1000}$ as you represent. 3,633 represents the total pounds of coal consumed which is taken as a divisor in the regular way, as shown in the formula, in order to determine the duty of engine in foot pounds per 100 lbs. of coal. 2. Will you briefly define the term Adiabatic curve. I can find no mention of it in Webster, Worcester, or Johnson's Dictionaries. Nor in the American, or Chambers' Cyclopœdias. Nor have I the paper you refer your correspondent to. *A.*—The word *Adiabatic* means *no transmission.* The *adiabatic curve* recognizes the fact that as the temperature of steam varies with the pressure, the fall of temperature which accompanies expansion, and the rise which accompanies compression, causes a greater change of pressure for a given change of volume than would take place if the temperature remained constant. The name *adiabatic* is applied to the curve, because if no transmission of heat takes place from without to the steam during expansion, or from it during compression, a change of temperature due to the change of volume must necessarily take place. The *adiabatic curve* is the true theoretical one. The AMERICAN MACHINIST of March, 1879, can be supplied at 6c. a copy.

(3) J. L. F., New York, writes: 1. I have a return tubular cylinder boiler, 3 ft. x 12 ft. shell, furnace 3 ft. x 4 ft., carrying a pressure of 50 lbs. of steam, and is kept free from sediment, having very little scale; in fact the two years that I have had charge, I have taken every care to keep things in first-class condition. On Friday last I noticed heavy sweating along the first seam, which I attributed to having cold water feed on too long, so on Sunday I put on 40 pounds cold water pressure, and found every thing tight as a drum. Then I made a thorough examination of fire plate, and found in the center of it, about 4″ from aforesaid seam, a blister about the size of a pigeon's egg, with a slight crack running across the top of blister. Will it be safe to run the boiler in this condition for a year, providing I reduce the pressure to 40 lbs., keep clean, and feed hot water? Could the blister have been caused by keeping cold water feed on too long? Could not the blister be there before I took charge? I know I should have the blister taken off, but I am so situated that it is almost impossible for me to have it repaired before next summer. Please give me a direct answer, as I shall carry out your instructions to the letter. *A.*—We judge from your description that the blister was caused by an imperfect weld in the plate when it was made, and an excessive heat upon the part caused it to swell out. If it is no larger than you describe, it might be drawn together by heating the part and inserting a bolt; afterwards driving a rivet; But the wisest course would be to have an inspection made by a competent boiler maker to determine the extent of the blister. It might run a year, but such a proceeding would be attended with a risk of the blister extending over a greater surface. 2. What is Vacuum? *A.*—The word Vacuum is derived from the Latin word *vacuus* and means, space empty or devoid of all matter or body.

(4) A. W., Cincinnati, O., asks: Please tell me what composition is used for casting the smaller iron parts of machines, such as guides, gears, wrenches, boxes, caps, etc? *A.*—Guides and gears are generally made of cast iron, while wrenches, levers and articles requiring greater strength, using less material, are sometimes made of malleable cast iron, and others of homogeneous steel, which is now very generally used, being quite as strong as forged wrought iron. Nearly every manufacturer has his own proportions for mixing the metal for castings. Those dealing the most honorably use more new metal and less scrap, while those less honorable use more scrap and less new material.

(5) A. W. M., Charlotte, N. C., asks: Please inform me what is the thickness of ordinary castings for water wheels? *A.*—Your question conveys no idea of what you desire, as you describe no size or style of water wheel. The thickness of castings upon a single turbine water wheel vary from 3-16″ to ½″. These proportions also vary with the diameter of the wheel.

(6) J. R., Chicago, Ill., writes: I am making a small engine, 3″ x 4″ cylinder, using the following proportions: Length of ports, 2¼″; width of steam ports, ¼″; width of exhaust port, ½″; width of bridges, 5-16″. Will you give me the best dimensions of a valve for this engine, with amount of steam and exhaust, lap or lead, to get the best results. I have reached a point where I am in doubt how to proceed. *A.*—Give the slide valve 3-32″ steam lap, and 1-32″ exhaust lead.

(7) L. E. P., Mayville, N. Y., asks: Which is the best packing for the piston rod of a high pressure engine, 14″ x 20″, running 120 revolutions per minute. Is plumbago packing good? *A.*—There are some fibrous packings which will wear very well in the stuffing box of a piston rod, but it must be of a substance that is not inclined to catch or hold gritty substances. A good metallic packing is far preferable to any other for cheapness and durability. A good quality of plumbago packing does very well, but the plumbago must be of the purest kind, which can only be procured from the most reliable dealers.

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50 cts. a line for each insertion under this head.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

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See Christiana Machine Co.'s adver., on page 14.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Alfred Wilkinson, No. 506 Walnut St., Philadelphia "Paragon" Piston-rod Packing, entirely metallic, automatic, frictionless, and practically free of steam pressure. Will work on high-speed or condensing Engines.

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James W. See, Designing and Consulting Engineer, Hamilton, Ohio.

"Extracts from Chordal's Letters" in book form, now ready. Cloth. 320 pages. $1.50 by mail, postpaid. American Machinist Publishing Co., 96 Fulton Street, New York.

J. C. Hoadley, Engineer and Expert, formerly of Lawrence, Mass., has opened an office at 29 High St., cor. Federal, Boston, Mass., where he will be pleased to receive old and new friends.

Yacht Engines as illustrated in No. 5 of this paper. Box 777, Owego, Tioga Co., New York.

Steam Engines Indicated and Examined. Power Measured. W. H. Odell, P. O. Box 274, Yonkers, N.Y

Bound volumes for 1880 of the AMERICAN MACHINIST.—We can furnish Vol. 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, neatly bound in cloth, ready to ship by express, for four dollars. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

MANUFACTURES.

The Aultman Mower and Reaper Works, Canton, O., are making for next season's trade 6,000 reapers and mowers, 2,500 wire binders, 1,500 vibrator threshers, and 500 engines for farming purposes.

It is announced that the Denver and Rio Grande Railway Company has contracted for the construction of 144 locomotives at a single establishment, the cost to aggregate about $1,000,000.

E. M. Boynton & Co., the well-known manufacturers of saws, New York city, have greatly enlarged their works and put in new machinery of the most improved pattern, capable of producing a half-million dollars worth of saws annually.

It is reputed that a wealthy company, formed at Providence, R. I., for the manufacture of locomotives, has purchased thirty acres of land between Irondale and Pullman, Illinois. The business of the East has increased so that the shops are all behind their orders. This will be the only establishment of the kind in the West. The situation of Pullman and the other large manufactories have attracted attention to this part of the country. The company is composed entirely of Eastern capitalists. —*Railway Review.*

The Manchester Locomotive Works have received an order from the Atchison, Topeka & Santa Fe Railroad for thirteen engines, to be finished by August 1.

Burnham, Parry, Williams & Co., proprietors of the Baldwin Locomotive Works, turned out 519, and entered orders for upward of 850 locomotives during 1880. Their capacity, large as it is, giving constant employment to upward of 2,800 men, is taxed to the utmost to meet the demand.

The Atlas Engine Works, Indianapolis, Ind., are running full, employing about 380 men, and are much crowded, especially with orders for their large Corliss and slide-valve engine work. Being prepared to make both engines and boilers on a large scale, they are receiving many choice orders for entire outfits for steam power. They claim to have the best plant of machinery, tools, patterns, etc., to be found west of Pittsburgh. They are now building a 300-horse power engine with boilers and shafting for a large lumber company in Minneapolis, and a 350-horse power Corliss engine and other machinery for a similar enterprise at Winona, Minn.—*Iron Age.*

Oberlin Smith, president of the Ferracute Machine Company, Bridgeton, N. J., writes us:

We have about doubled our business within two years past, and are now building a casting room, and extending our two-story 56-foot machine shop to 100 feet, besides having erected a new blacksmith shop. We have just purchased of Betts Machine Company a set of standard internal, external and master gauges and adjustable reamers, to replace our former home-made affairs. We find business good, and have all we can do, with about fifty employes, in our specialty of presses and dies.

J. O. Whitehouse, shoe manufacturer, of Poughkeepsie, N. Y., has just connected one of Korting's Universal Injectors, which is lifting water 22 feet, and then drawing it through 350 feet of horizontal pipe, feeding into his boilers direct.

The Merchants' Telegraph Company was incorporated at Springfield, Ill., Jan., 24th, with $1,000,000 capital. The principal office is to be in Chicago, and the company is authorized to construct lines from that city to any portion of the United States.

The lumbermen of Pennsylvania never enjoyed a more favorable season for getting logs to the streams.

In her first trial trip, the big engine Lovett Eames drew a train of fifteen loaded freight cars up a grade, on the Boston and Albany road, at a place where railroad men said no engine could ever start the train. The grade for four miles is thirty eight feet to the mile, and the Eames took the train up with perfect ease.

The Exeter Machine Works, Exeter, N. H., at their recently-held annual meeting, voted a semi-annual dividend of 3½ per cent. and agreed to increase the capital stock to $60,000 in order to increase their capacity to fill orders. W. W. Stickney was selected president, and W. B. Morrill treasurer. A vote of thanks to the agent, Mr. Burlingame, for his efficient conduct of the business of the works was unanimously passed.

Machinists' and Engineers' Supplies.

NEW YORK, Jan. 27, 1881.

The market this week shows a good business with a slightly weaker tendency in prices in many articles

Striking hammers, sledges, heavy hammers and other steel goods have declined about 10 per cent. the discount to large consumers being now 40 per cent.

A number of makers of files have held a meeting, the result of which discioses weaker prices. The list prices remain practically unchanged, but discounts are 5 per cent. greater, making discount 35 per cent. to 37½ per cent., and on large orders from consumers 40 per cent.

Henry B. Newhall, 105 Chambers St., has just taken the New York Agency for Gillespie Bros' wrought iron solid box vises.

Orders from Mexico continue to be a prominent feature of the New York market.

Iron and Metal Review.

NEW YORK, January 27, 1881.

Pig iron is steady and without change in prices as follows: No. 1, Foundry, $25. No. 2, $22 and Forge, $20. Scotch brands are selling as follows: Eglinton, $22 to $22.50. Cornbroe, $22.50. Glengarnock and Gartsherrie $23.50 to $24. Old T rails are scarce and holders are asking $30 a ton. Bar iron is very steady on the basis of 2.5c. for refined out of store.

Boiler plates are steady at the following prices: Tank, 3c.; Refined, 3¼c.; Shell, 3¾c. to 4c.; Flange, 4¾c. to 5c.; Firebox, 5½c. to 6c. Boiler tubes are selling at 40 per cent. discount from list.

In conformity with the new designations of boiler plates and to avoid any misunderstanding, the Central Iron Works of Harrisburg, Pa., have issued a circular from which we quote as follows:

"Believing it to be the interest of the general public, in the safe use of steam boilers, that they should be made of very reliable material of uniformly good quality, we urge upon all boiler makers the advisability of using no grade of iron below C. H. No. 1 Flange in the construction of Boilers, and with a view to guard so far as possible against any misunderstanding that might arise as to the quality of iron indicated by our stamps, we have given a full list of grades manufactured by us, with a statement as to their quality and what we guarantee for each."

S. F. B. (SOLID FIRE BOX.)—Made from the best selected coal blast charcoal hammered blooms, and used for locomotive fire boxes, etc. When this grade is wanted for difficult flanging it should be so ordered.

EXTRA FLANGE.—Made from extra quality cold blast charcoal hammered blooms, to stand very severe flanging such as "flue holes," etc.

MARINE FLANGE.—Made from best cold blast charcoal hammered blooms with great care, and used for marine boilers, etc.

C. H. No. 1 FLANGE.—Made from charcoal hammered blooms and fully adapted to ordinary flanging purposes, and for use in the construction of first-class boilers.

SHELL.—Made from selected iron reheated, and used for cylinder of boilers, etc., but not guaranteed to flange.

REFINED.—Made from refined stock, to take the place of C. No. 1, and used for any ordinary plain work.

TANK.—Made from clean puddled iron and used for tank purposes, etc.

LUCIUS HART & CO., 8 & 10 Burling Slip, New York, furnish us the following to-day:

Since our last, Pig Tin has been active both in Europe and in the home market. Pig Tin, in London £91, 10s., with a strong upward tendency; Singapore, $28¾. Transactions here amount to about 1000 tons, sales and resales—tone of market is firm. We quote at present writing: Banca Tin, 25c.; Malacca and Straits 21c.; Billiton, Australian and "Lamb & Flag," 20¾c. to 21c.; Bar Tin, 22c.; Pig Lead steady and strong, some 2000 tons sold this week, including Common and Refined, price 5c. to 5¼c., as to lots; Antimony, from 15c. to 16c., as to brands; Spelter, steady at 5¼c. to 5¾c. for Western; "Bertha," pure, 8¼c.; Solder No. 1, 11½c.; "Half and Half," 13½c.; Bismuth, $2.50.

WANTED

A mechanical engineer of large experience in designing first class engines, flouring mills and general machinery, making estimates and contracts, and as superintendent, will soon desire a re-engagement. Address American, care AMERICAN MACHINIST, 96 Fulton Street, New York.

Wanted.—By a graduate of the Scientific School at an eastern college, who has had practical experience in machine design, a situation as draughtsman and designer. Good references. Address, Draughtsman, P. O. Drawer 38, New Haven, Conn.

Wanted.—An experienced Machine Tool Draughtsman with prospect of permanent situation at good wages. Address, stating experience, salary desired, &c., "Tool Shop" care AMERICAN MACHINIST.

Manufacturers desiring the services of an advanced mechanic, competent to organize and construct special tools and machinery for, and manage the systematic manufacture of sewing or other light machines, will find such by addressing Box 5, office AMERICAN MACHINIST, 96 Fulton St., N. Y.

Situation wanted by a practical machinist, draughtsman and designer. Have had long experience as manager and foreman in machine shop. Address, F. F., care AMERICAN MACHINIST.

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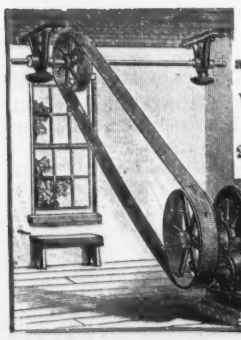
BAKER BLOWER



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The revolving parts are all accurately Balanced.

Warranted Superior to any other.

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For Cupola and Charcoal Blast Furnaces, Run-out, Knobling and Refining Fires.

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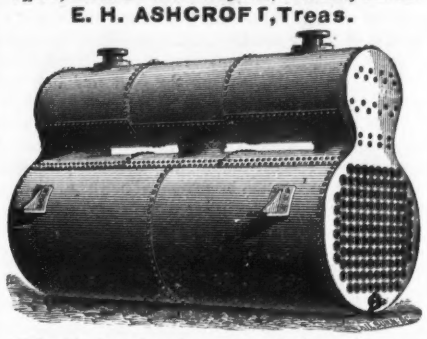

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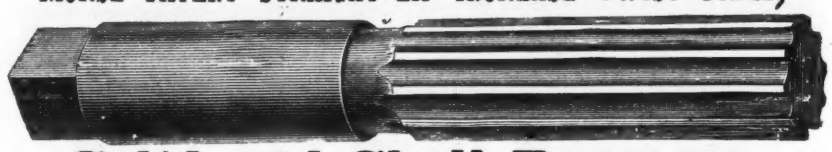

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The best and cheapest in the end. Send for quotations. The files speak for themselves in the following testimonials. Read them.

THE SINGER MANUFACTURING CO.

Messrs. KEARNEY & FOOT, Elizabethport, N. J., July 9th, 1877.

Dear Sirs:—We have for the past ten years used the Files of your manufacture, and during that time we have never had any fault to find with them. We can safely affirm that for evenness of temper, sharpness of cut, accuracy of shape and all other qualities which go to make up a perfect File, they are equal, and in some respects superior, to the best English-made Files. Very Truly, WM. H. INSLEE, Contractor.

Messrs. KEARNEY & FOOT, Elizabethport, N. J., May 3rd, 1877.

Gentlemen:—We have been using your Files, both new and re-cut, for several years, and take pleasure in saying that we have found them a very superior article.

HANS REISE, Contractor, with The Singer M'f'g Co.

We print instructions on the use of Files, and also give the diameters of round and square Files from 3 to 16 inches. They are on card board, 10x12 in., and are intended to be put up in the shop for the men to read. We are pleased to mail them to any manufacturer on receipt of the necessary 6 cents postage.

Respectfully, KEARNEY & FOOT.

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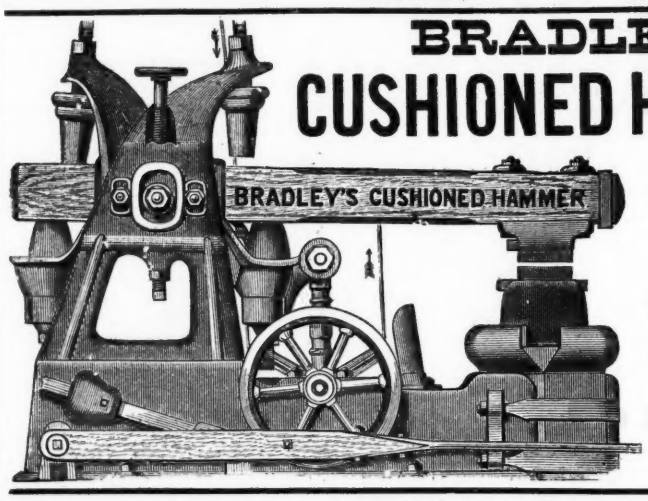

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It approaches nearer the action of the smith's arm than any hammer in the world.

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THE FAIRBAIRN PATENT GAUGE COCK

THE BEST IN EXISTENCE.

Self Closing and Requires no Packing,

And can be Cleaned Out while Steam is in the Boiler.

It has been tried for two years, and has given entire satisfaction on both Stationary and Marine Boilers. For descriptive circular address

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Friction Pulleys, Clutches and Elevators

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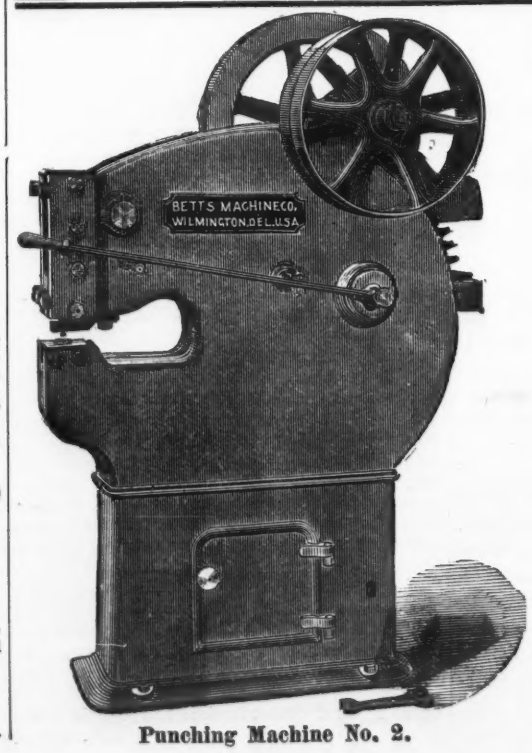

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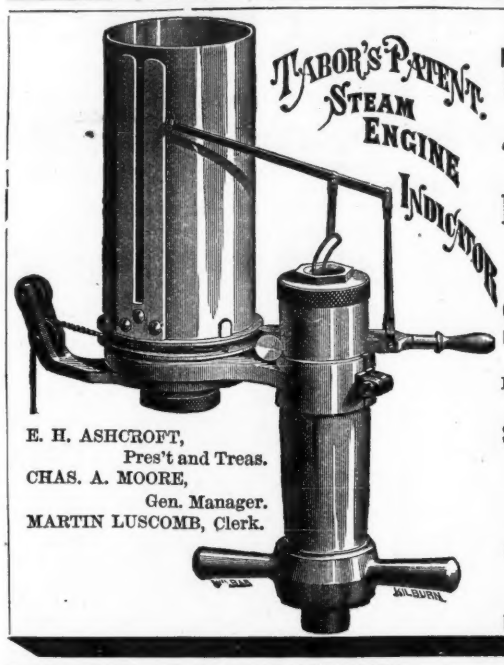

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TABOR'S PATENT
STEAM ENGINE INDICATORS.
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SOLE MANUFACTURERS OF

Patent Hot Polished Shafting.

This shafting commends itself to the trade generally as superior to any shafting ever before introduced to the market for the following reasons, viz.:

1st.—It is perfectly straight and round.

2d.—It can be rolled accurately to any desired gauge.

3d.—It has the beautiful blue finish of Russia Sheet Iron, rendering it less liable to rust or tarnish than shafting of the ordinary finish.

4th.—It will NOT SPRING OR WARP IN KEY SEATING like most of the other manufactured shafting sold in the market, and, as a consequence, is admirably adapted for LINE AND COUNTER SHAFTING.

5th.—The surface is composed of MAGNETIC OXIDE OF IRON, forming a superior journal or bearing surface.

6th.—It is made of superior stock.

Sizes made from ¾ inch to 3 inches, advancing by sixteenths, and from 3 inches to 4 inches, advancing by eighths. Price lists, with references and other information, furnished on application to us.

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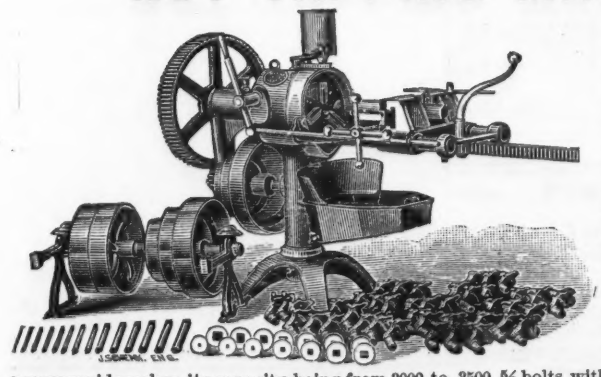
MANUFACTURERS OF

Schlenker's Revolving-Die Bolt Cutter AND NUT TAPPING MACHINE.



OUR NEW REVOLVING-DIE MACHINE is now recognized by practical machinists to be the perfection of a Screw Cutting Machine, and we now challenge the world to produce its equal. It possesses many advantages over any competitor. The dies are opened automatically when the desired length of thread has been cut on the bolt, and are closed by the lever, or automatically, as shown in the cut of the machine. It can be changed from one size to another in less than a minute without removing a bolt or pin. It does not require skilled labor, but can be operated by any competent boy. The dies are arranged to open and close automatically, therefore do not require the constant attention of the operator. It is a very rapid worker, its capacity being from 3000 to 3500 ⅝ bolts with 1½ inches of thread per day—and larger bolts in proportion. Threads cut by these machines will not vary ½ thread in length on ten thousand bolts. The machines are simple in construction, very compact and strongly built, and are offered much below the price of any other machines capable of cutting the same sizes, and amount of work. It is adapted to cut right and left hand, V thread, square threads, and coach screws,—will take in crooked as well as straight work, and cut any length of bolt. The machines are now largely in use, and we offer them to the trade as one of the most complete machinists' tools in the market. Every machine is warranted as recommended.

HOWARD IRON WORKS, Buffalo, N. Y.

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FOR SIMPLICITY OF MECHANISM
—AND—
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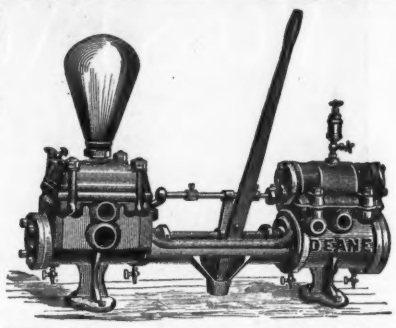

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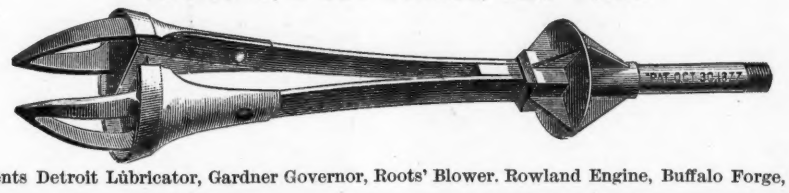

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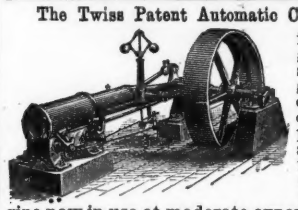

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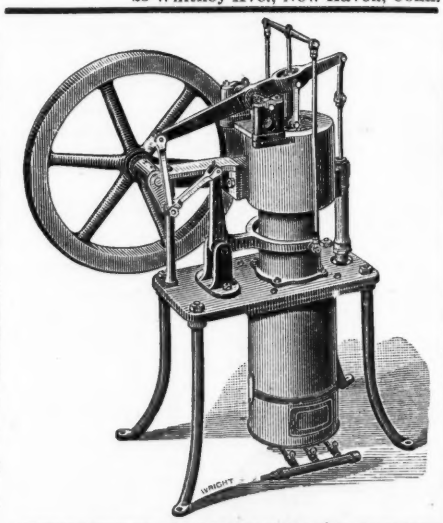

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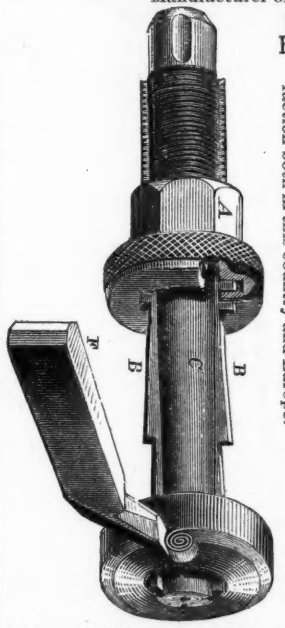

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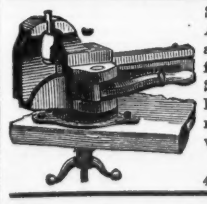

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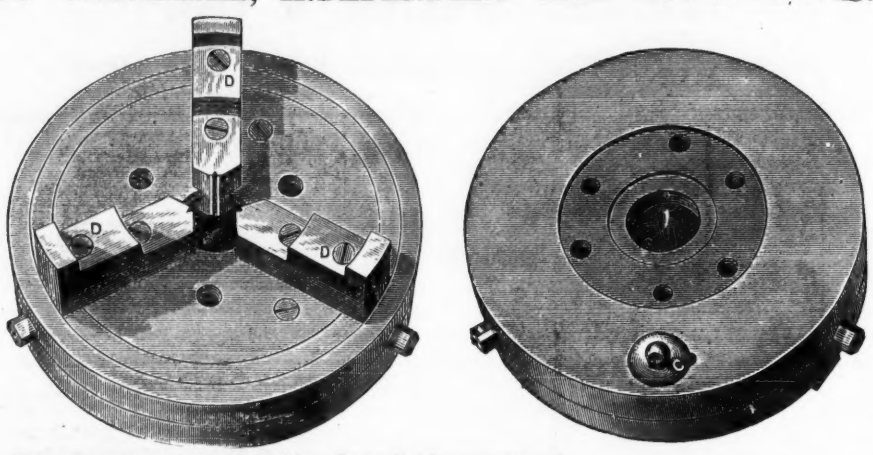

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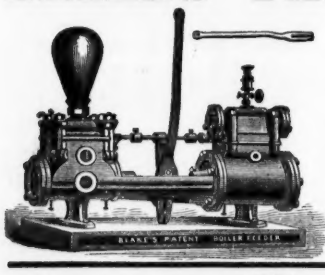

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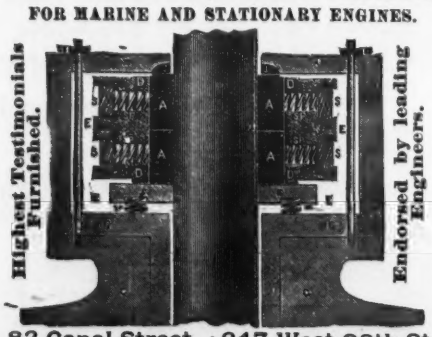

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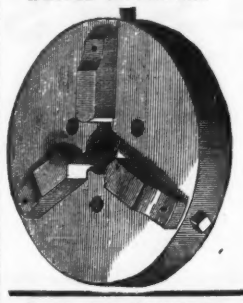

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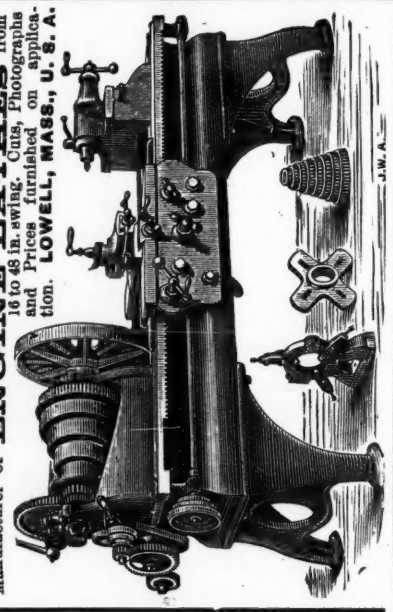

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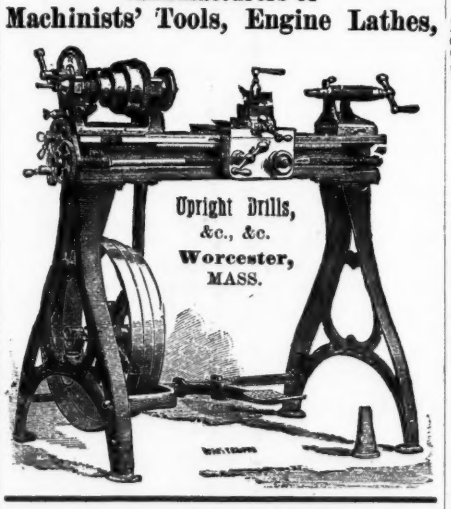

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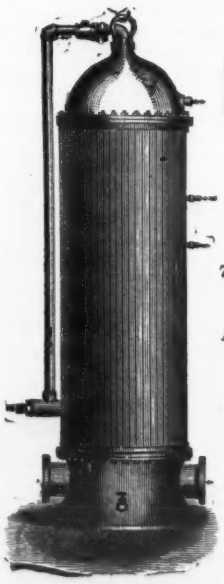

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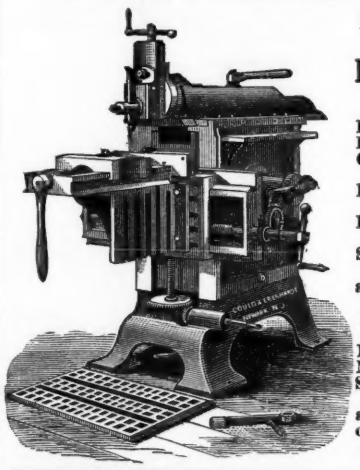

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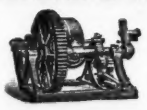

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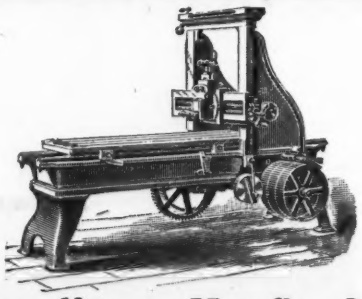

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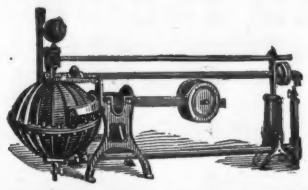

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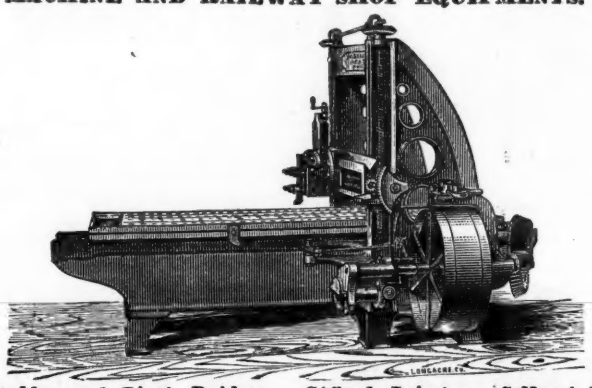

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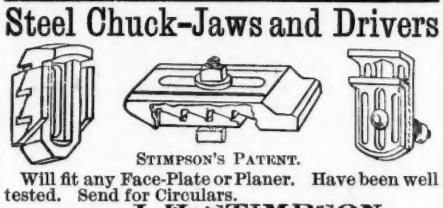

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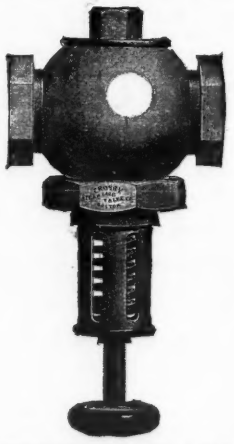

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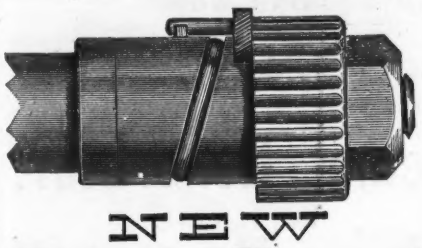

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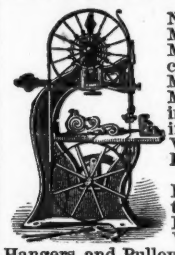

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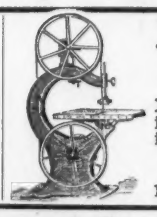

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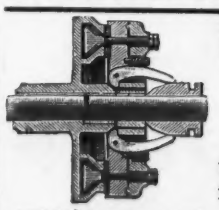

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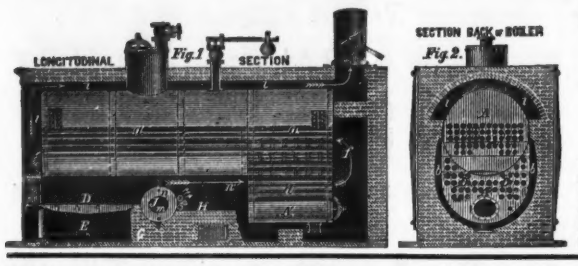

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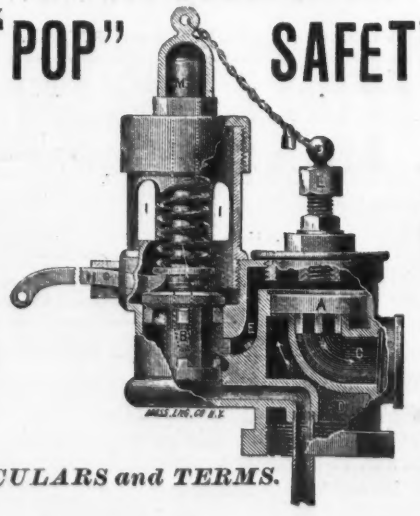

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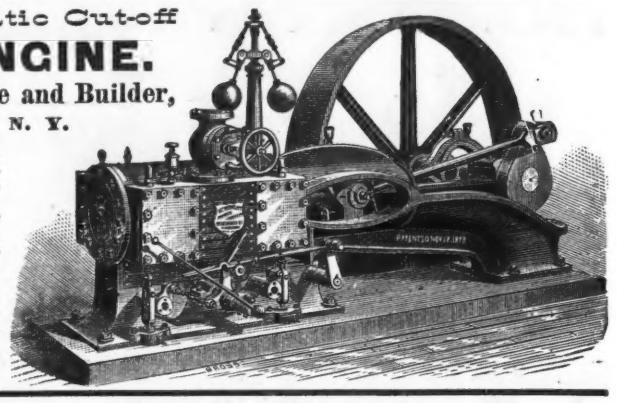

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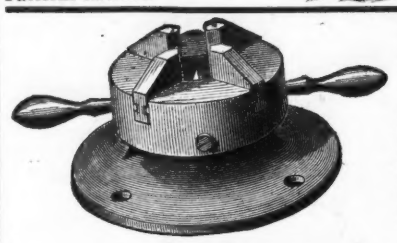

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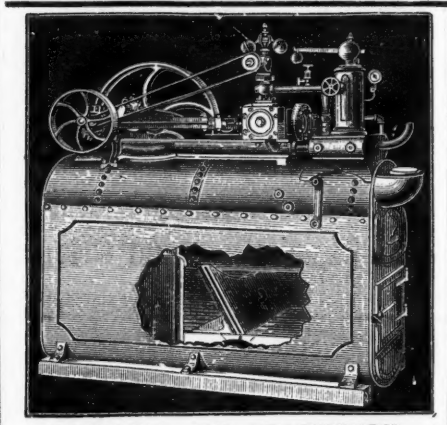

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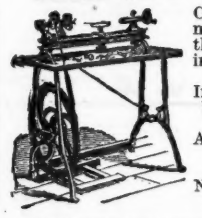

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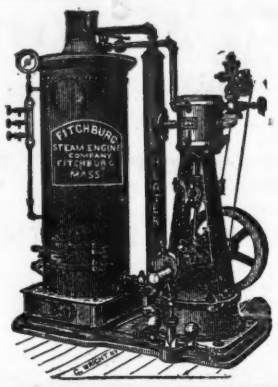

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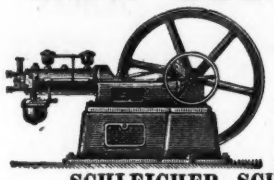

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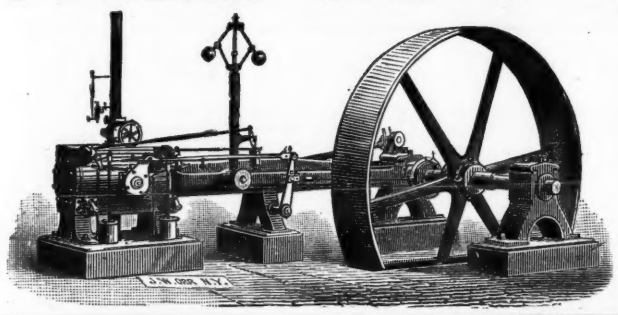

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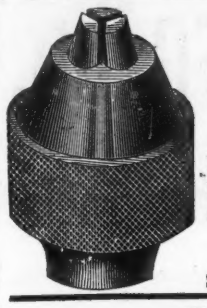

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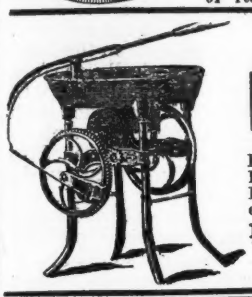

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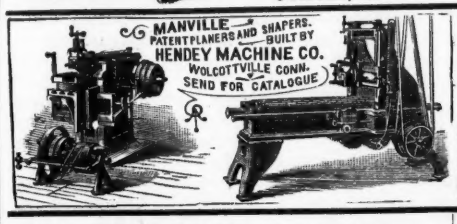

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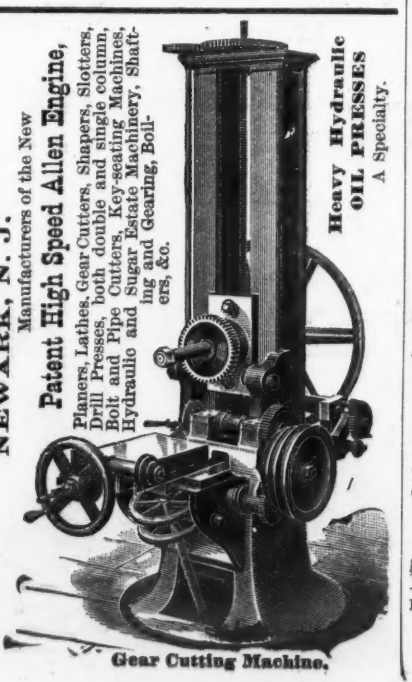

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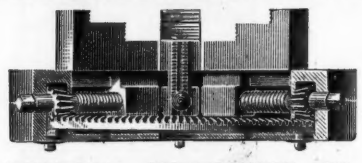

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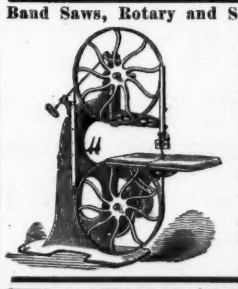

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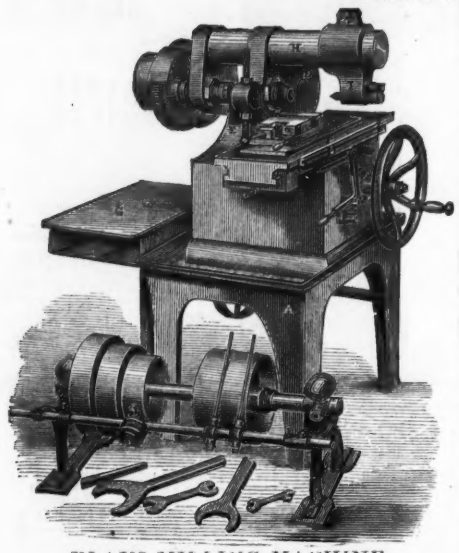

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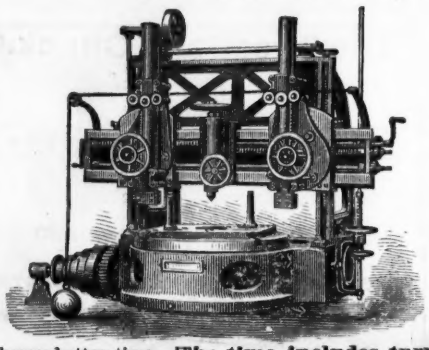

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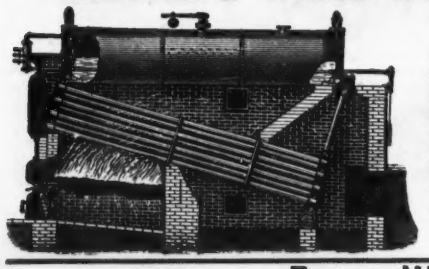

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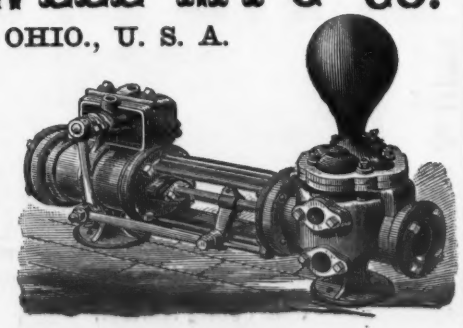

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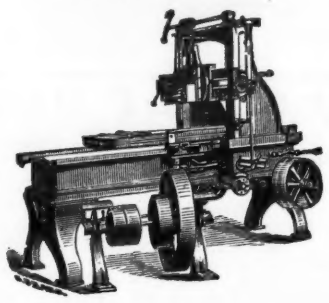

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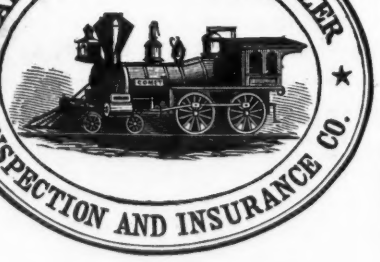

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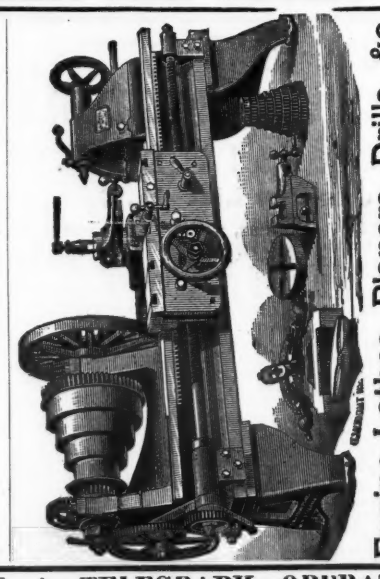

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